JOHNSON

VIKING I

TRANSMITTER KIT

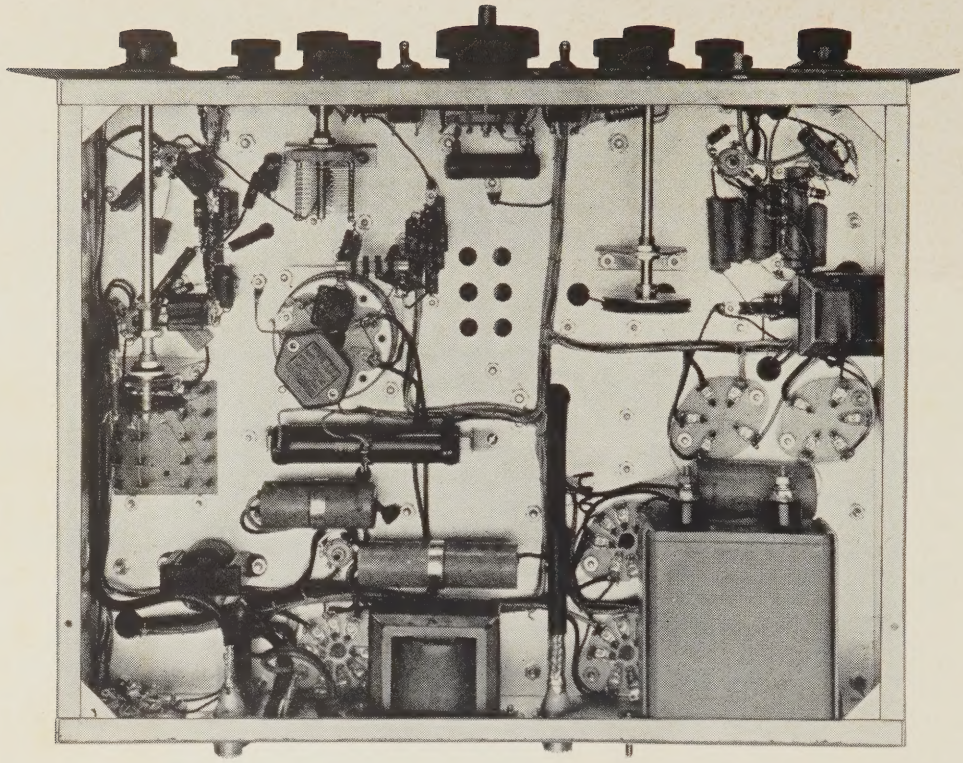
150 WATTS INPUT
AM PHONE AND CW
BANDSWITCHING 10-160 METERS

E. F. JOHNSON COMPANY

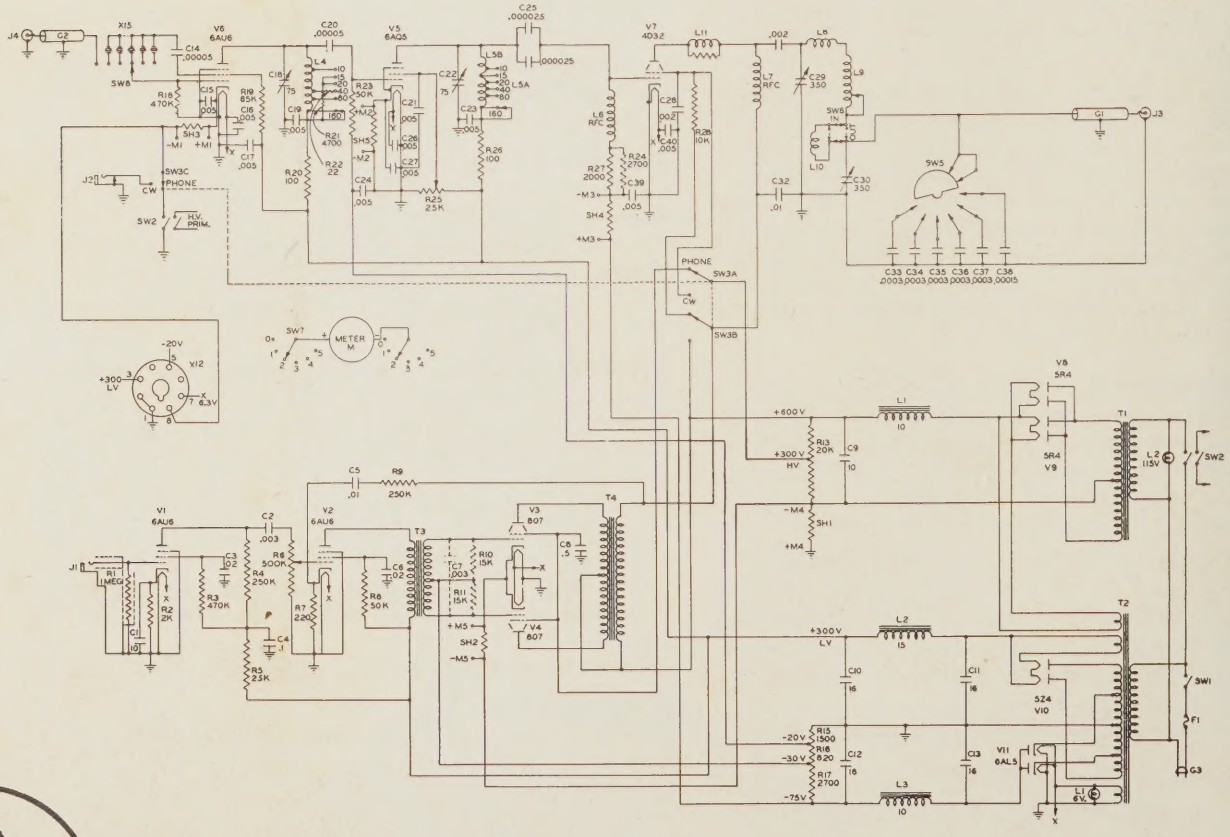
a famous name in Radio !

WASECA, MINNESOTA

CATALOG 705



Chassis bottom view



Schematic Diagram

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10M 6-50

Printed in U. S. A.

It is recommended that the following illustrations, diagrams and charts be removed for easy reference while assembling, wiring and testing the Johnson Viking I Transmitter.

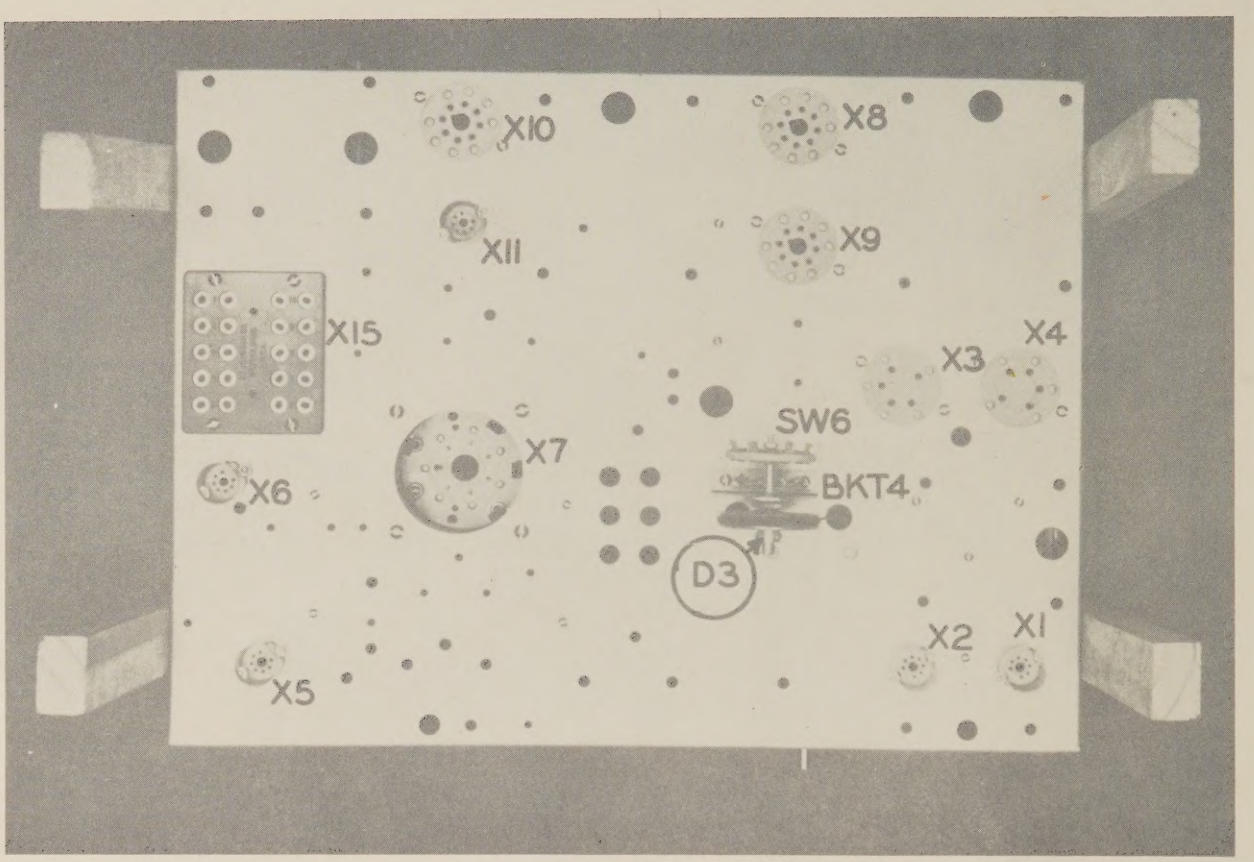


Figure 1

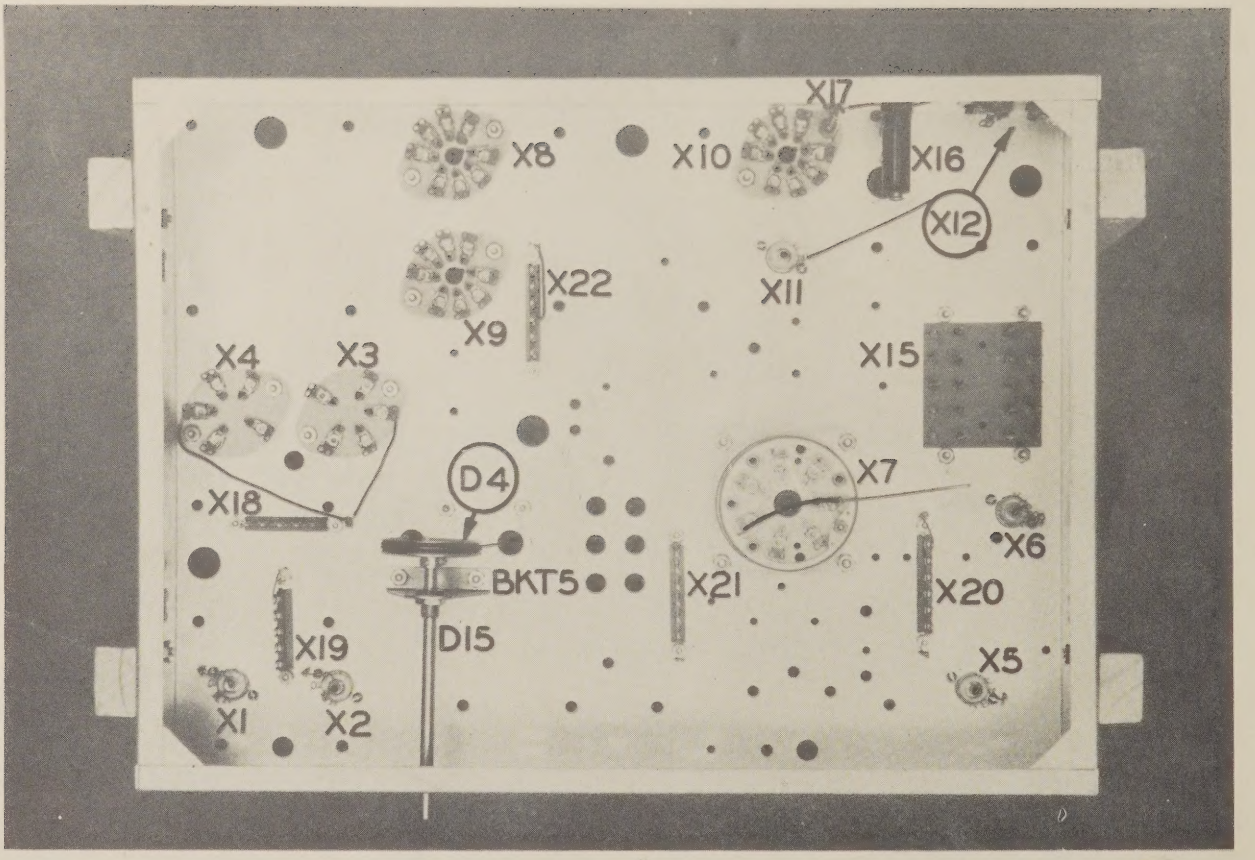


Figure 2

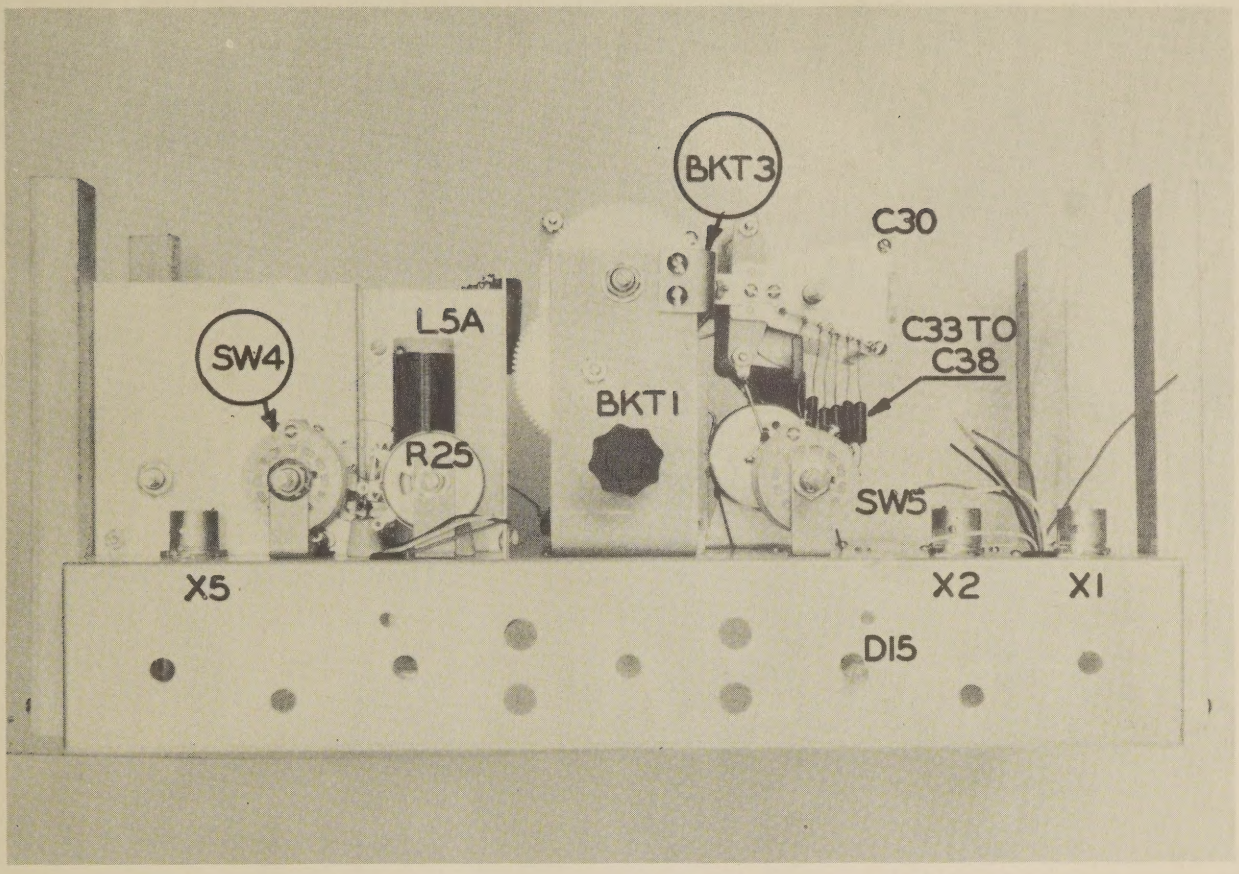


Figure 3

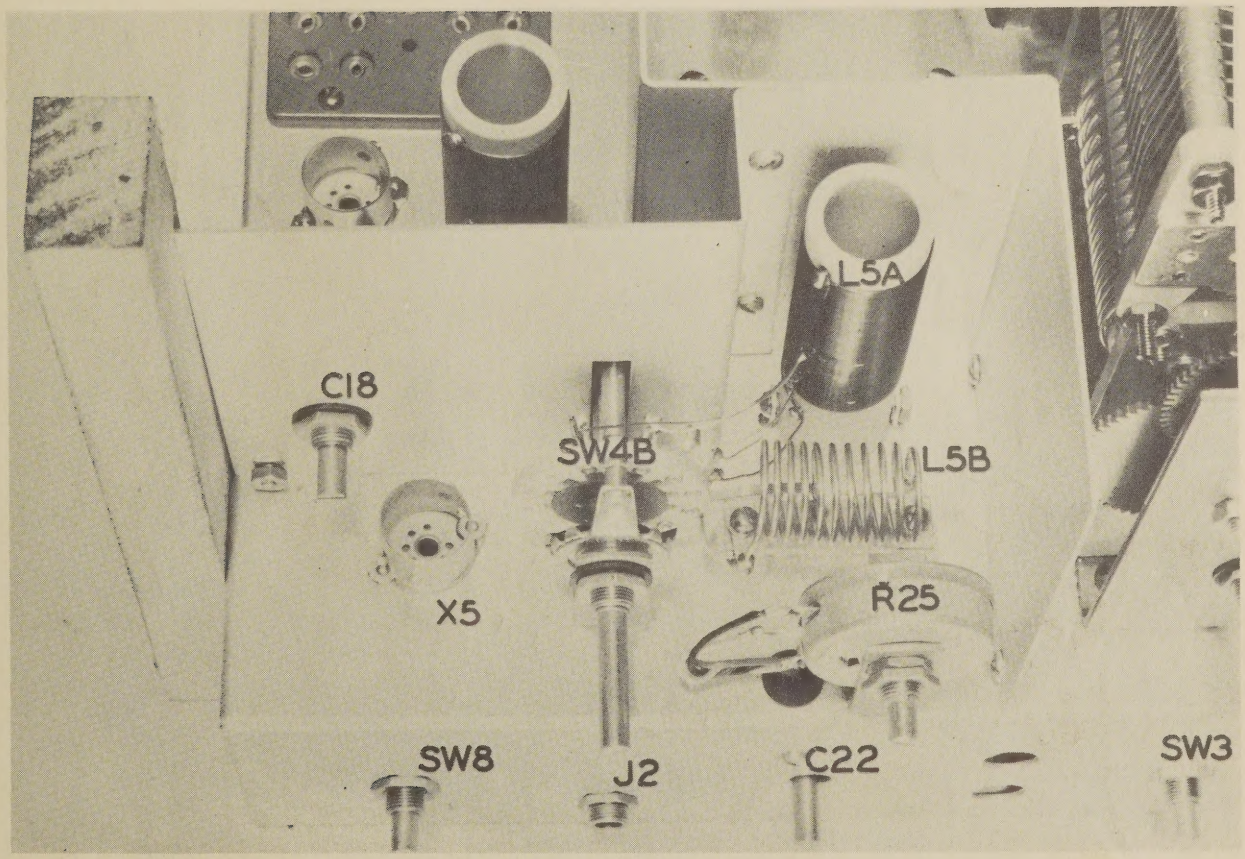


Figure 4

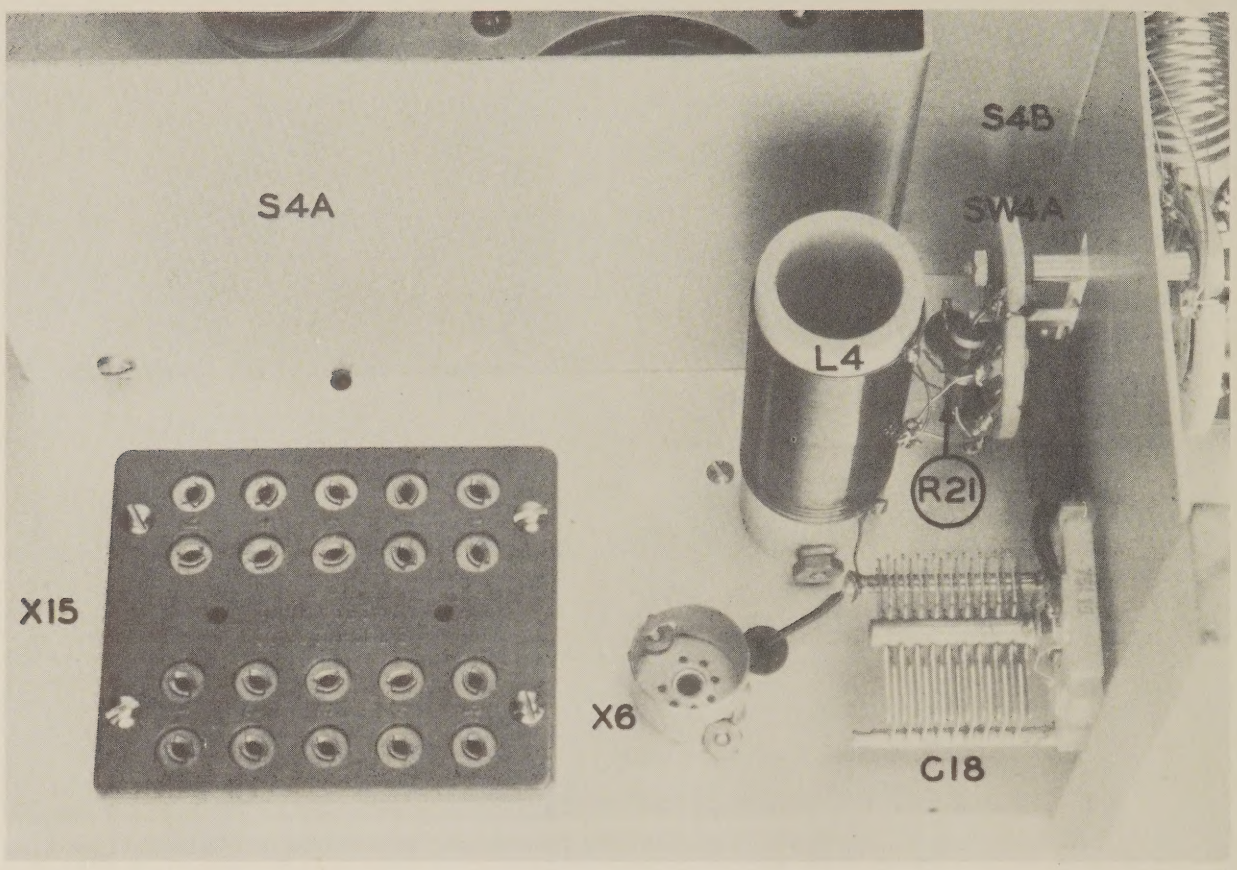


Figure 5

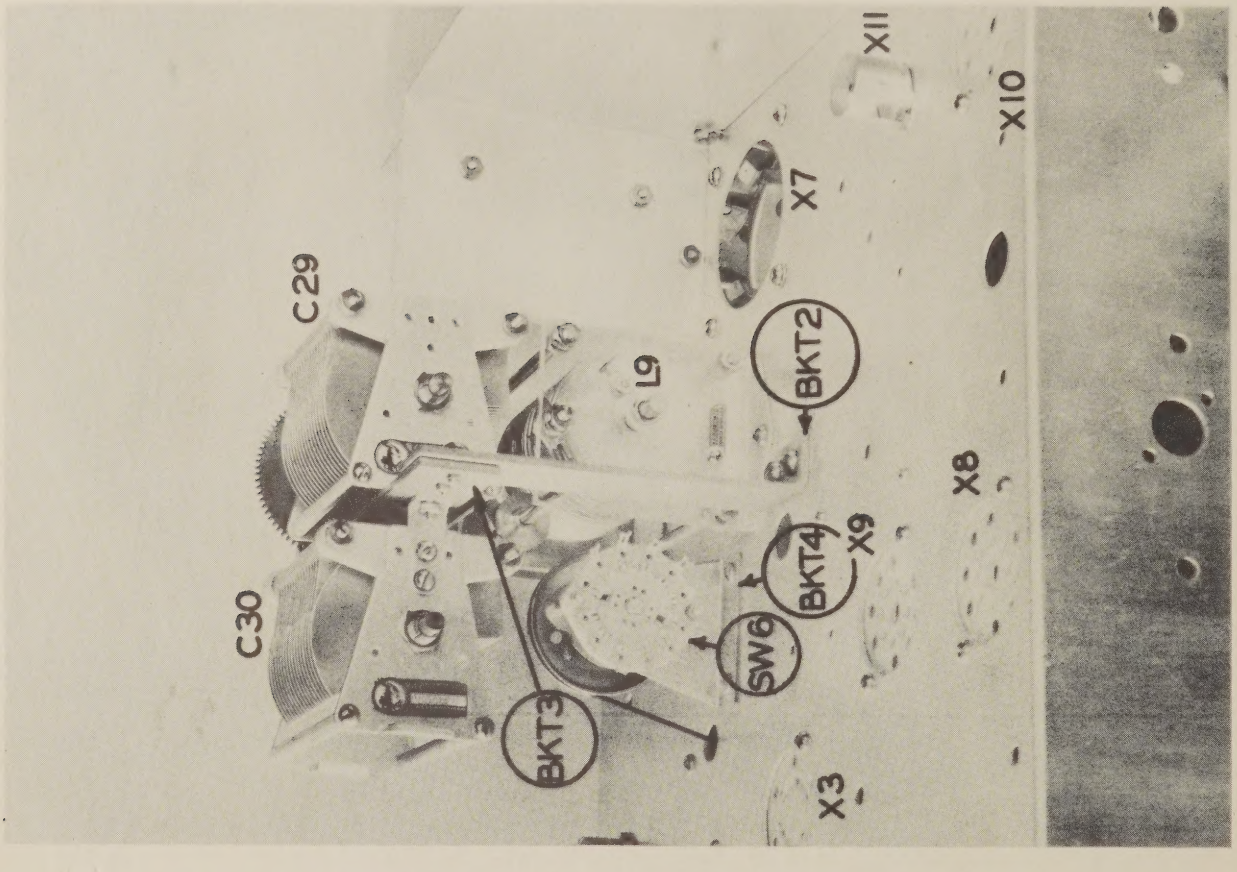


Figure 6

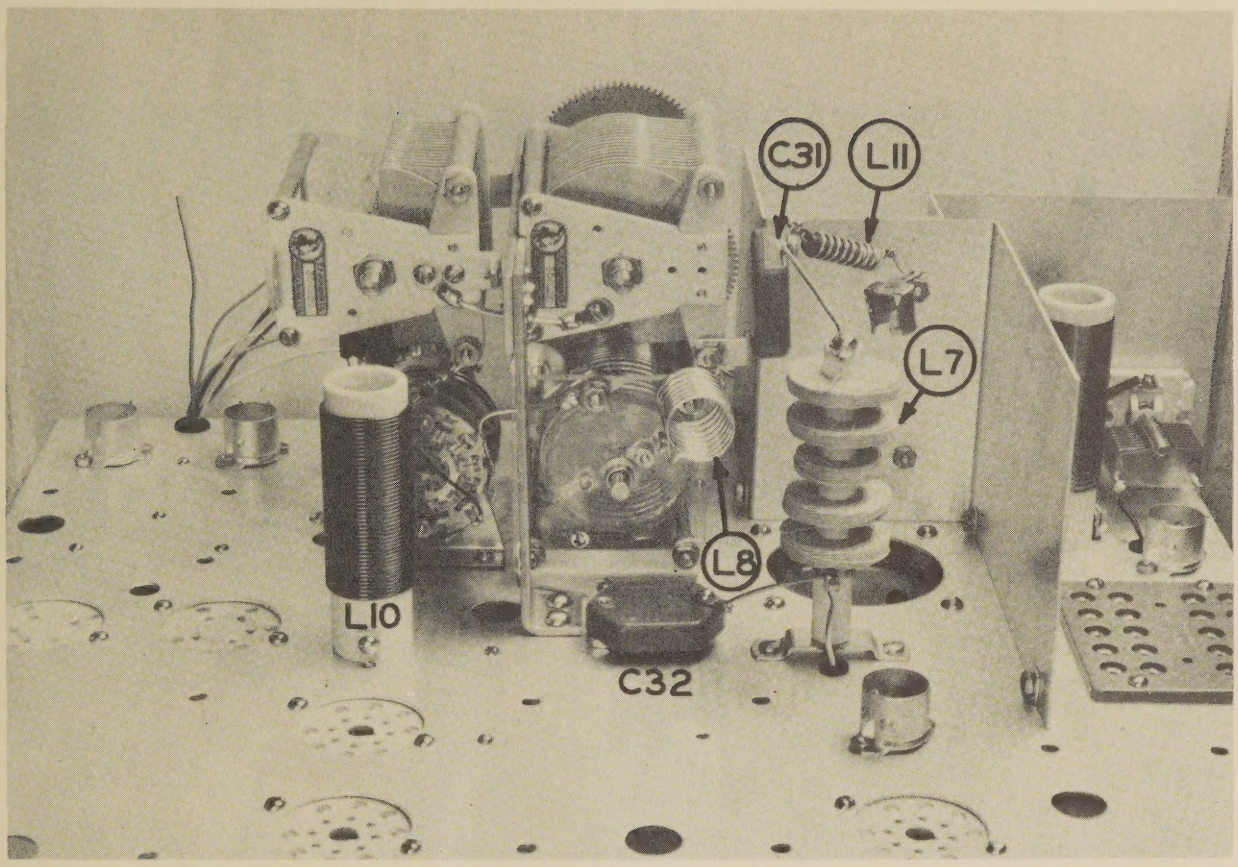


Figure 7

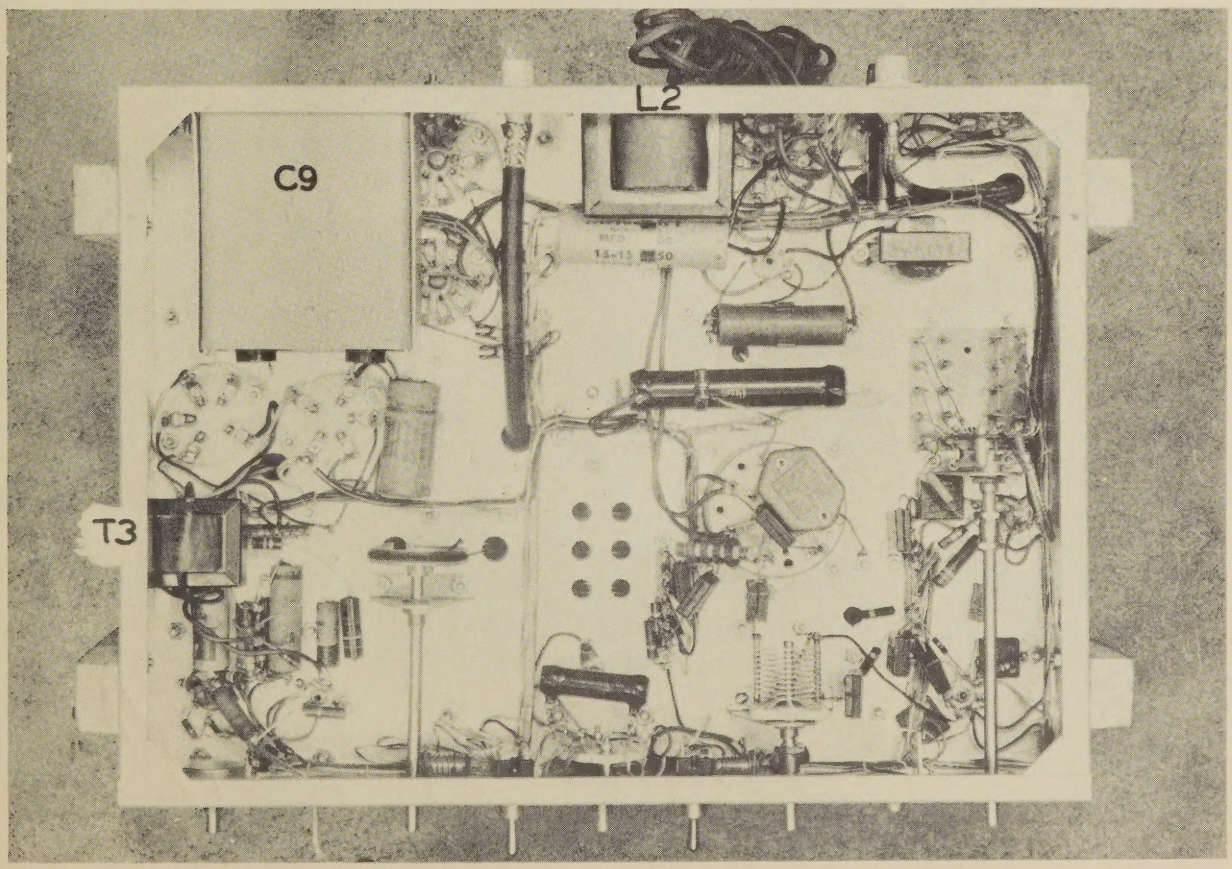


Figure 8

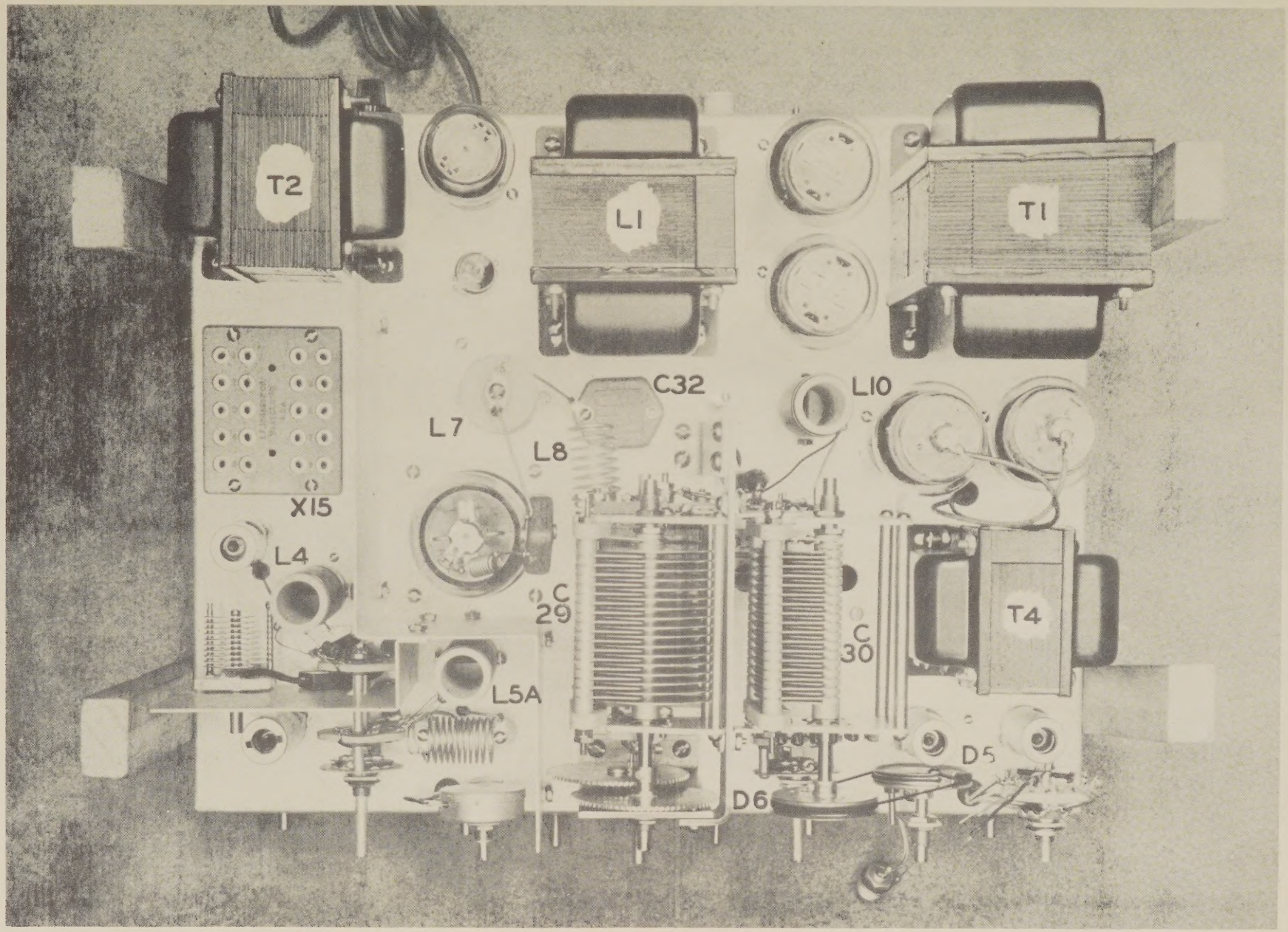


Figure 9

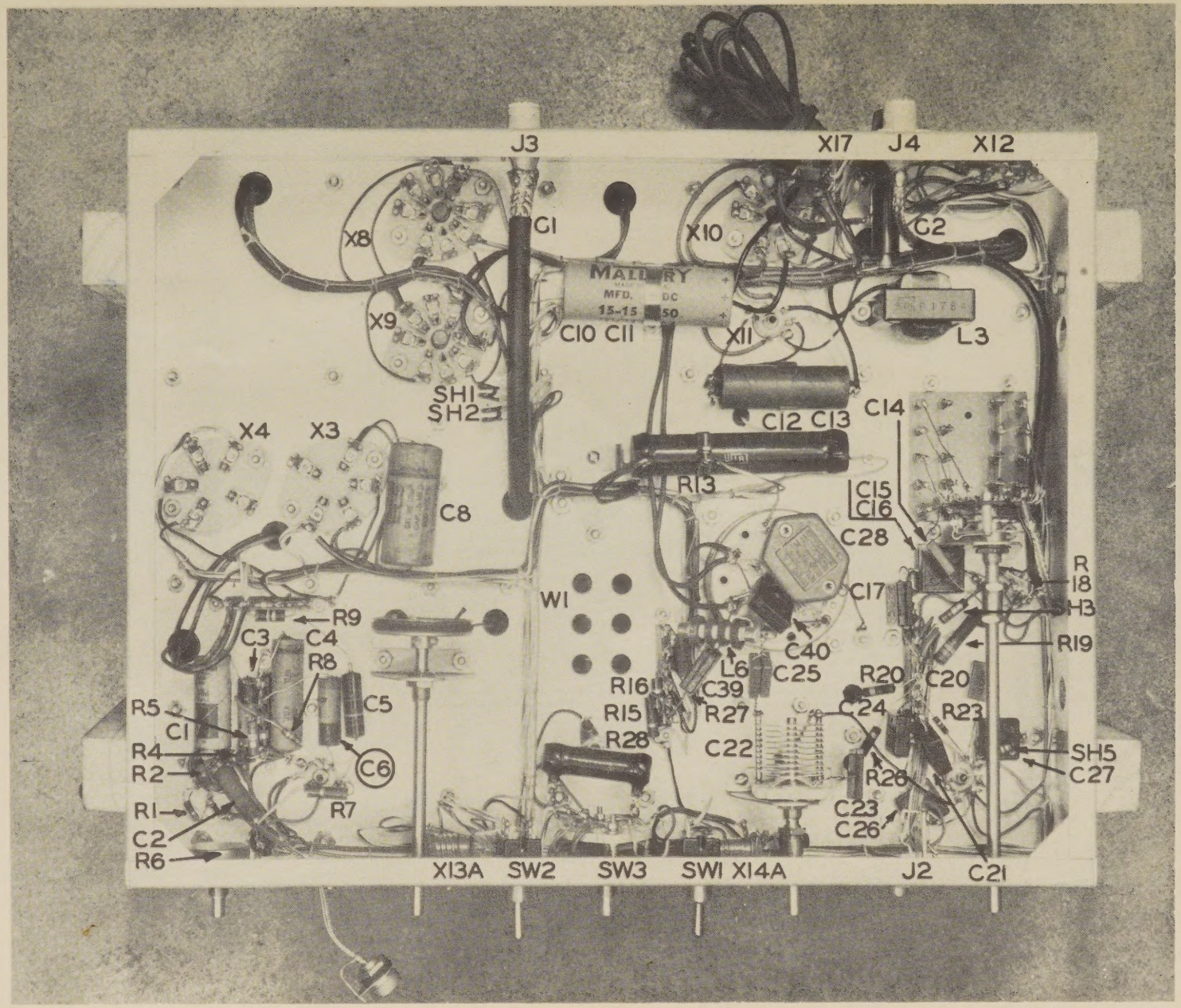
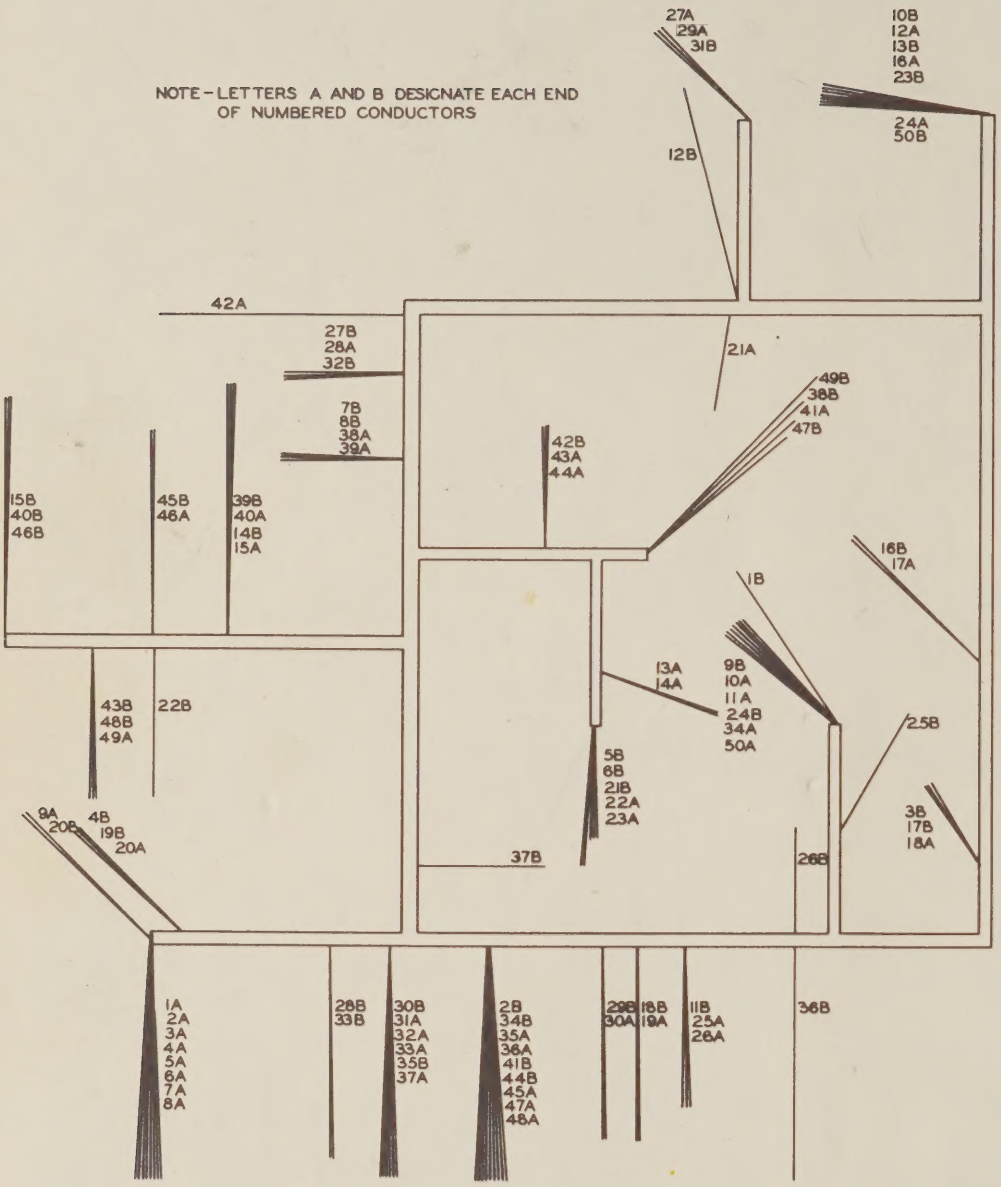

J3
X17
J4
X12
G1
X8
X10
C2
MALLORY
MFD. DC
15-15 50
X9
C10 C11
X11
L3
SH1
SH2
C12 C13
C14
X4
X3
R13
C15
C16
C8
C28
R
18
C17
SH3
W1
R9
C3
C4
R19
C40
R8
L6
C25
R20
C20
R16
C39
C24
R23
C5
R5
R15
R27
C1
R28
C22
SH5
R4
C27
R2
C6
R26
R1
R7
C23
C26
C2
R6
X13A
SW2
SW3
SW1
X14A
J2
C21

Figure 10



LEAD COLORS	
1	BLUE
2	BROWN
3	GREY
4	BLACK
5	ORANGE
6	WHITE
7	YELLOW
8	VIOLET
9	RED
10	RED
11	RED
12	RED
13	GREEN
14	GREEN
15	GREEN
16	GREEN
17	GREEN
18	GREEN
19	GREEN
20	GREEN
21	WHITE
22	BLACK
23	BLACK-BROWN
24	BLACK-BROWN
25	WHITE
26	BLACK
27	BLACK-BROWN
28	BLACK-BROWN
29	WHITE
30	BLUE-ORANGE
31	BLUE-ORANGE
32	GREY-RED
33	GREY-RED
34	BROWN
35	ORANGE
36	BLUE
37	BLACK
38	YELLOW
39	VIOLET
40	VIOLET
41	GRAY-RED
42	VIOLET
43	VIOLET
44	VIOLET
45	YELLOW-BLUE
46	YELLOW-BLUE
47	GREY
48	GREEN-WHITE
49	GREEN-WHITE
50	BROWN

Figure 11, Wiring Harness

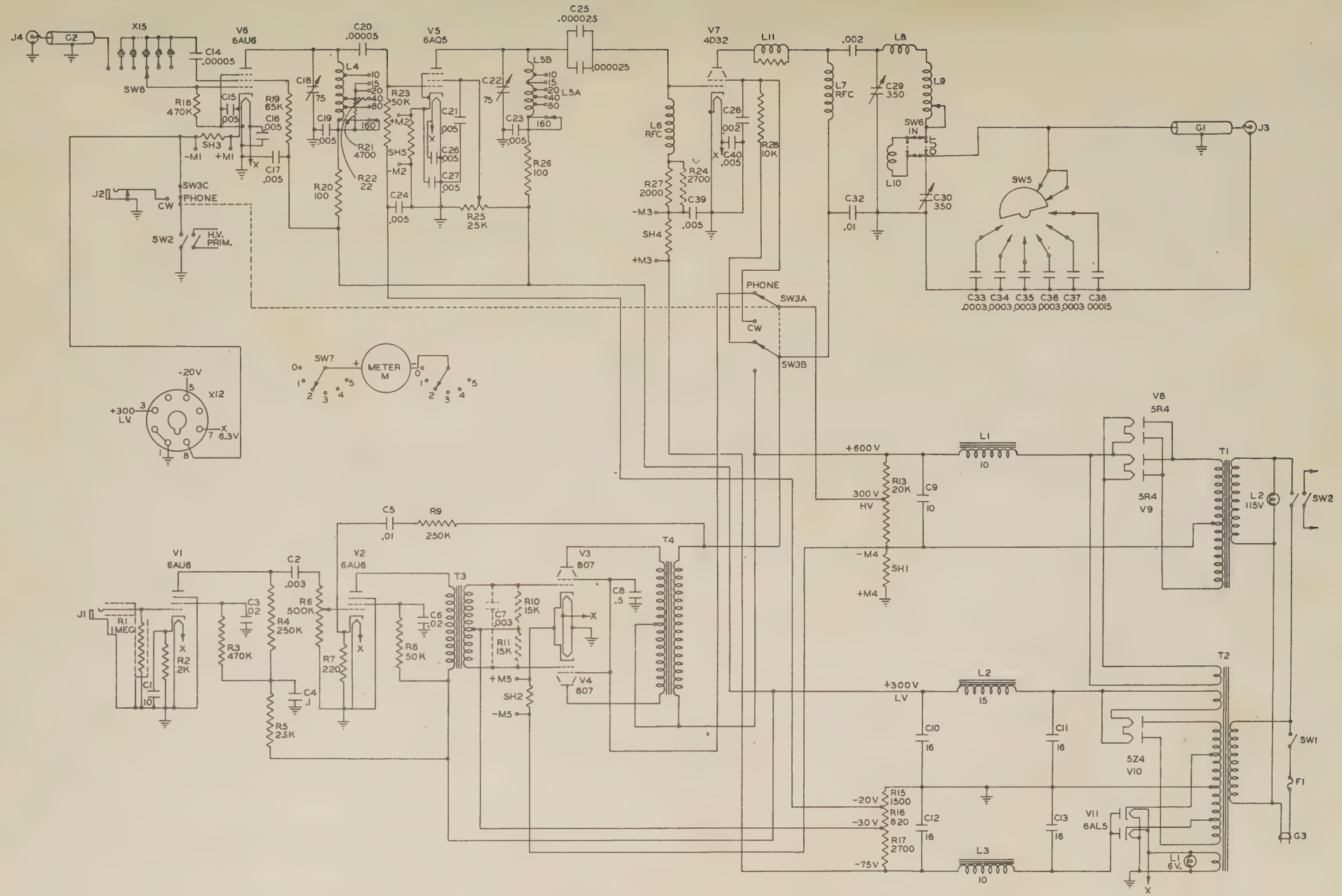


Figure 12, Circuit Diagram

TUBE SOCKET CONNECTIONS BOTTOM VIEW

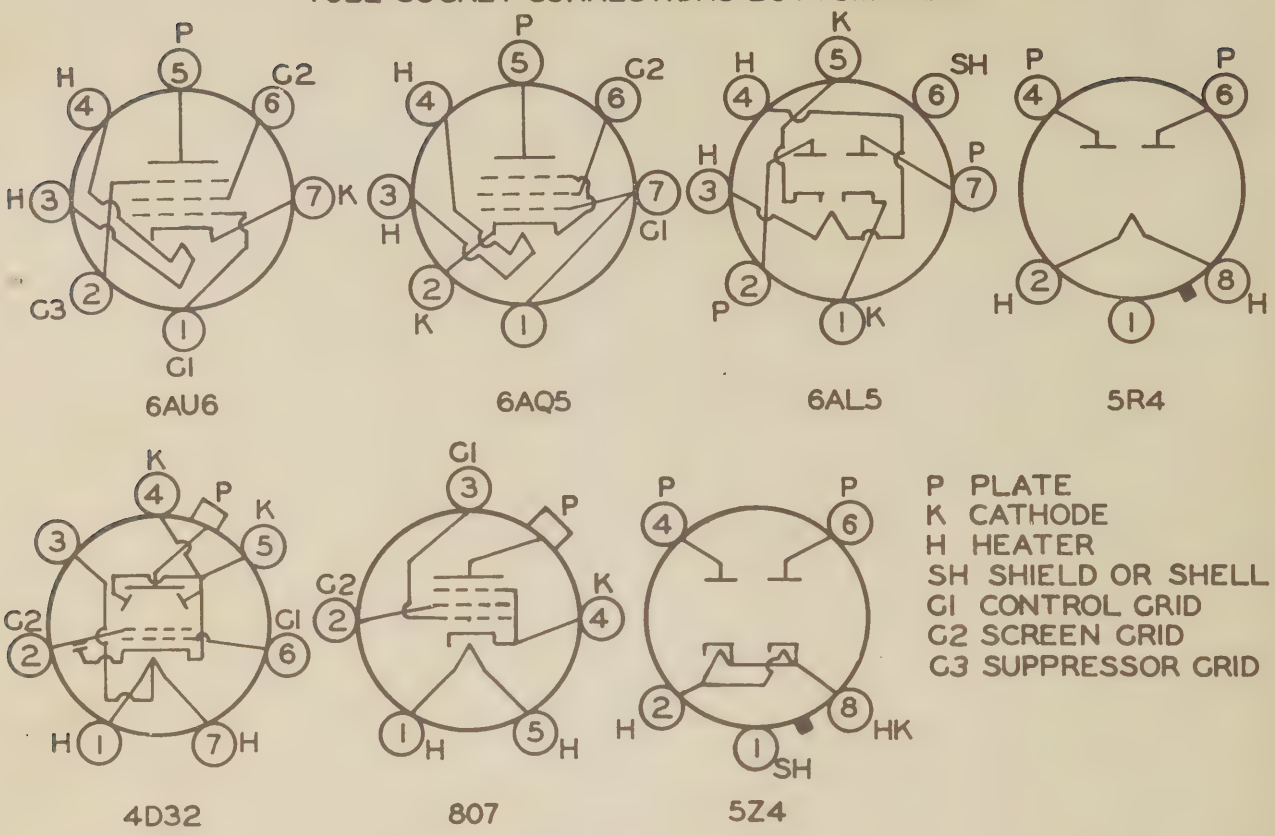


Figure 13, Socket Connections

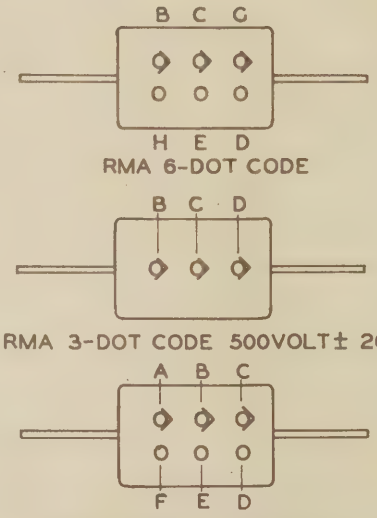
CONDENSER–RESISTOR COLOR CODE

COLOR	SIGNIFICANT FIGURE	DECIMAL MULTIPLIER	TOLERANCE (%)		VOLTAGE RATING*
BLACK	0	1	–		—
BROWN	1	10	1		100
RED	2	100	2		200
ORANGE	3	1,000	3		300
YELLOW	4	10,000	4		400
GREEN	5	100,000	5	*	500
BLUE	6	1,000,000	6		600
VIOLET	7	10,000,000	7		700
GRAY	8	100,000,000	8		800
WHITE	9	1,000,000,000	9		900
GOLD	–	0.1	5		1,000
SILVER	–	0.01	10		2,000
NO COLOR	–	—	20		500

* APPLIES TO CONDENSERS ONLY

COLOR CODING OF FIXED RESISTORS

A–FIRST SIGNIFICANT FIGURE OF RESISTANCE IN OHMS
B–SECOND SIGNIFICANT FIGURE
C–DECIMAL MULTIPLIER
D–RESISTANCE TOLERANCE IN PERCENT. IF NO COLOR SHOWN TOLERANCE IS ± 20%.



COLOR CODING OF FIXED CONDENSERS

A–TYPE: MICA BLACK, PAPER SILVER
B–FIRST SIGNIFICANT FIGURE OF CAPACITY
C–SECOND SIGNIFICANT FIGURE
D–DECIMAL MULTIPLIER
E–TOLERANCE
F–CHARACTERISTIC
G–THIRD SIGNIFICANT FIGURE
H–VOLTAGE RATING

Figure 14, Resistor-Condenser Color Codes

MODIFICATION B FOR VIKING II TRANSMITTER

(Equally applicable to all VIKING I Transmitters)

Incorporation of Modification B in the VIKING transmitter will extend the usable low frequency audio range to 250 cycles and will further attenuate high frequency response above 3000 cycles.

The change is accomplished by converting V2, the 6AU6 audio driver to a triode, removing the feedback circuit and changing plate and screen resistors of V1, the first audio stage, to higher values. Total audio gain is slightly higher.

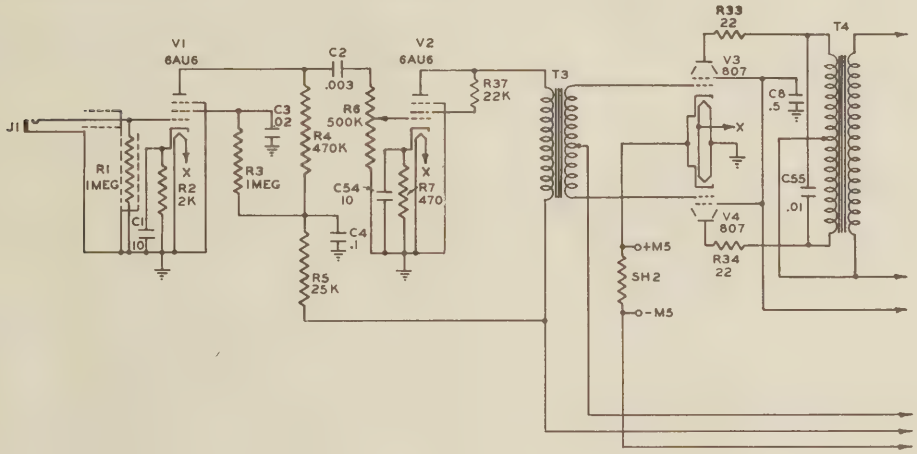
The 23.1033 modification kit consists of the following material:

1—470,000 ohm ½ watt resistor.
1—1.0 megohm ½ watt resistor.
1—470 ohm ½ watt resistor.
1—10 mfd. 25 volt electrolytic capacitor.
1—.01 mfd. 1500 WV ceramic disc capacitor.
2—22 ohm ½ watt resistors.
1—length of spaghetti tubing.
1—22,000 ohm ½ watt resistor

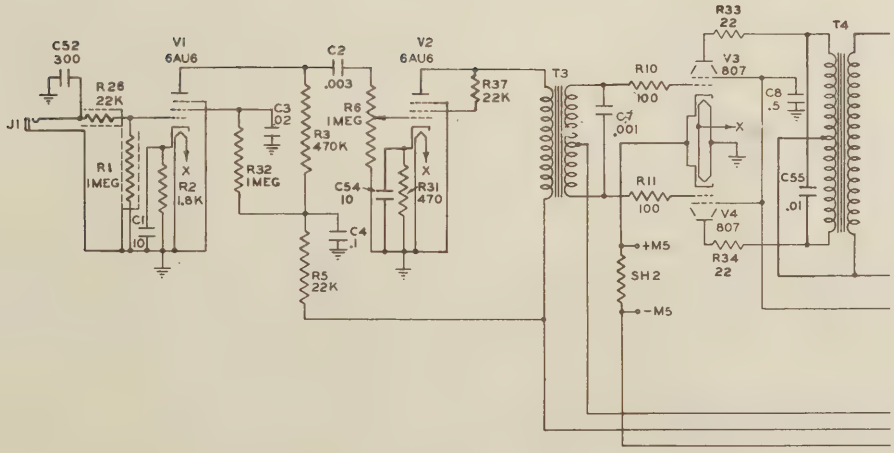
The following items furnished for Viking II Transmitters, are not required for Viking I:

1—56 ohm 1 watt resistor.
1—10,000 ohm 2 watt resistor.
1—.1 mfd. 400 volt tubular capacitor.
1—23.1301 relay plug.

Affected portions of schematic diagrams are shown below.



VIKING I AUDIO



VIKING II AUDIO

Detailed Instructions for Incorporation

1. Loosen the audio driver transformer T3 by removing its mounting screws.

2. Remove the black lead of T3 and wiring harness lead 22B (black) from terminal board X18. Slip a 1" length of insulated tubing over lead 22B. Solder lead 22B to the black lead of T3. After cooling, slide the tubing over the solder joint.

3. Remove R9, 220,000 ohm 1 watt resistor from terminal strip X18.

4. Remove C5, .01 mfd. capacitor connected between pin 7 of socket X2 and the terminal of X18 nearest the center of the chassis.

5. Remove R8, 47,000 ohm 1 watt resistor connected between pin 6 of X2 and the center terminal of terminal board X19.

6. Remove C6, .02 mfd. capacitor connected between pin 6 of X2 and ground.

7. Remove R4, 220,000 ohm 1 watt resistor connected between pin 5 of socket X1 and the terminal of X19 nearest the front of the chassis.

8. Remove R3, 470,000 ohm ½ watt resistor connected between pin 6 of socket X1 and the terminal of X19 nearest the front of the chassis.

9. Remove R7, 220 ohm ½ watt resistor connected between pins 4 and 7 of X2.

10. Connect the 1 megohm ½ watt resistor from the modification kit between pin 6 of socket X1 and the terminal of X19 nearest the front of the chassis. Solder at pin 6 only.

11. Solder the 470,000 ohm ½ watt resistor from the modification kit between pin 5 of socket X1 and the terminal of X19 nearest the front of the chassis.

12. Connect the 470 ohm ½ watt resistor from the modification kit between pins 4 and 7 of socket X2. Solder at pin 4 only.

13. Connect the positive terminal of the 10 mfd. 25 volt capacitor from the modification kit to pin 7 of X2, the negative terminal to the ground lug at the rear of terminal board X19. Solder at both points.

14. Between pins 5 and 6 of X2 solder the 22,000 ohm ½ watt resistor from the modification kit.

15. Unsolder the plate cap connectors from the blue and brown leads of the modulation transformer T4. Pull the leads back through the grommet in the chassis.

16. Train the blue lead to the terminal of X18 nearest the center of the chassis, trim to length, strip ⅜" of the insulation and tin the lead with solder. Connect but do not solder to the terminal. Save the excess length of blue lead.

17. Train the brown lead to the terminal of X18 adjacent to the end terminal to which the blue lead was previously connected. Cut the brown lead to length, strip ⅜" of the insulation, tin with solder and connect to the terminal second from the end of X18 nearest the center of the chassis.

18. Connect the excess lengths of blue and brown lead to the corresponding terminals of X18 to which the transformer leads of the same color were connected. Do not solder.

19. Solder the .01 mfd. 1500 volt ceramic disc capacitor from the modification kit between the end terminal of X18 nearest the center of the chassis and the next adjacent terminal. Don't permit the capacitor to touch the chassis.

20. Run the blue and brown leads from X18 through the grommet between the 807 sockets. Slide a 1½" length of insulating tubing over each of the leads.

21. Strip ⅜" of insulation from the brown lead, tin with solder. Trim one of the leads of a 22 ohm ½ watt resistor from the modification kit to about ⅜", form a hook in the lead and solder to the brown lead. In the same fashion solder the other 22 ohm ½ watt resistor to the blue lead.

22. Solder an 807 plate cap to each of the remaining 22 ohm resistor leads. Shorten the resistor leads so that the plate cap connector is close to the body of the resistor. When the solder connections are cool, slide the insulated tubing over the resistors and the ends of the plate cap connectors.

    NOTE: It will no longer be necessary to observe polarity when connecting 807 plates.

23. Secure the audio driver transformer using the original hardware.

THE FOLLOWING INSTRUCTIONS APPLY ONLY TO VIKING II TRANSMITTERS

24. Remove L22, 4.7 microhenry choke connected between pin 3 of socket X17 and the end terminal of X25 nearest the crystal socket X15.

25. In place of L22 just removed, solder the 56 ohm 1 watt resistor from the modification kit.

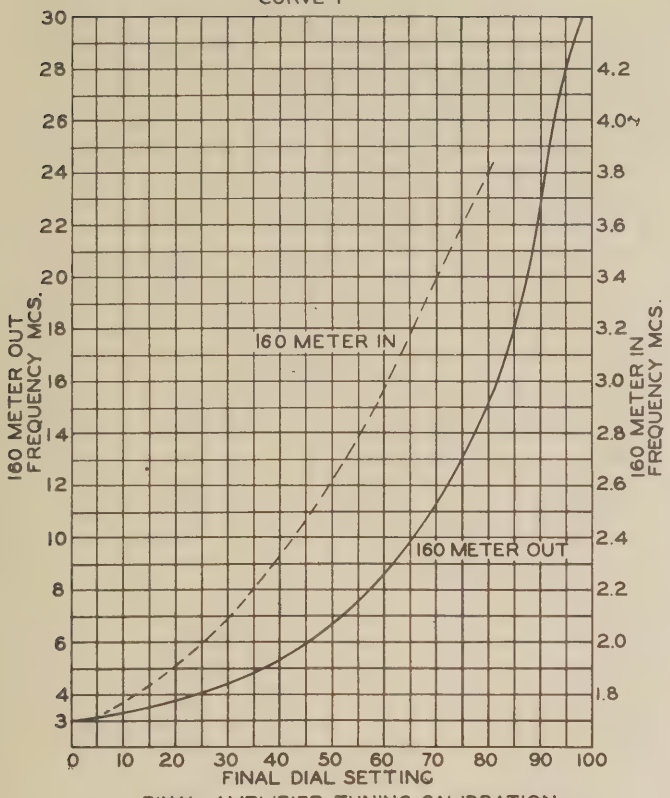
26. Looking at the front deck of the bandswitch, SW4B, from the shaft end, refer to the upper left hand terminal as No. 1, the adjacent terminal No. 2 and the balance of the terminals in consecutive order in a clockwise direction, the last terminal being No. 7. The 10,000 ohm 2 watt resistor from the modification kit is to be installed between SW4B and the exciter shield. Cut to length and solder the resistor leads, one to terminal No. 4 of SW4B, the other to terminal No. 1 of SW4B.

27. (It is assumed that Modification A has been installed or that the subject Viking II transmitter conforms to the Schematic Diagram, Figure 12, in which the 6AQ5 clamper tube V28 appears.) Connect the .1 mfd. 400 volt capacitor from the modification kit between pin 5 of socket X3 and the terminal of R30 to which R29 has been previously connected. The end of the capacitor marked "ground" or "outside foil" should be connected to X3. Solder at both points.

28. Remove L15, 4.7 microhenry choke connected between pin 7 of the VFO power socket X12 and the terminal of X24 to which the green harness leads are connected. Wind a self-supporting, single layer, close wound choke of No. 20 or No. 22 solid insulated wire, ¼" inside diameter, 15 turns. Solder this choke in place of L15 just removed.

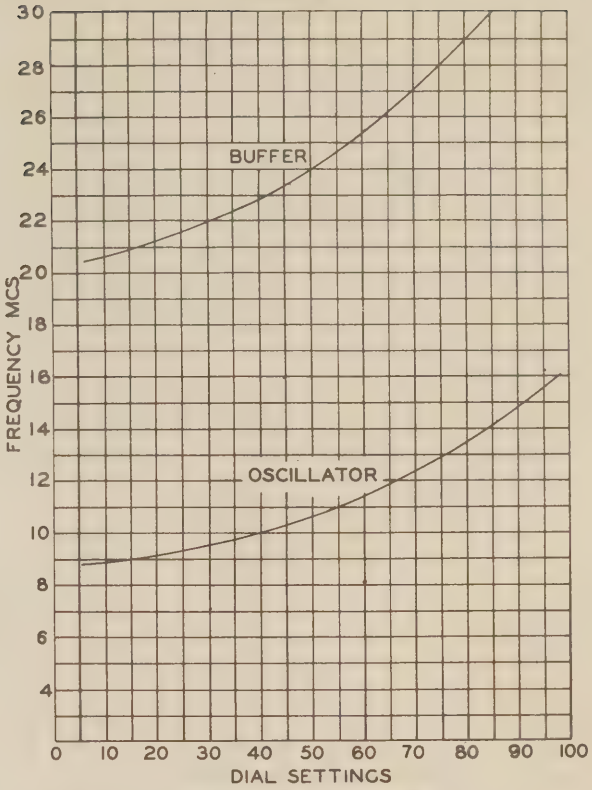
    The connector 23,1031 will serve to connect an antenna changeover relay to the antenna relay socket J5 on the rear of the Viking II chassis.

CURVE 1



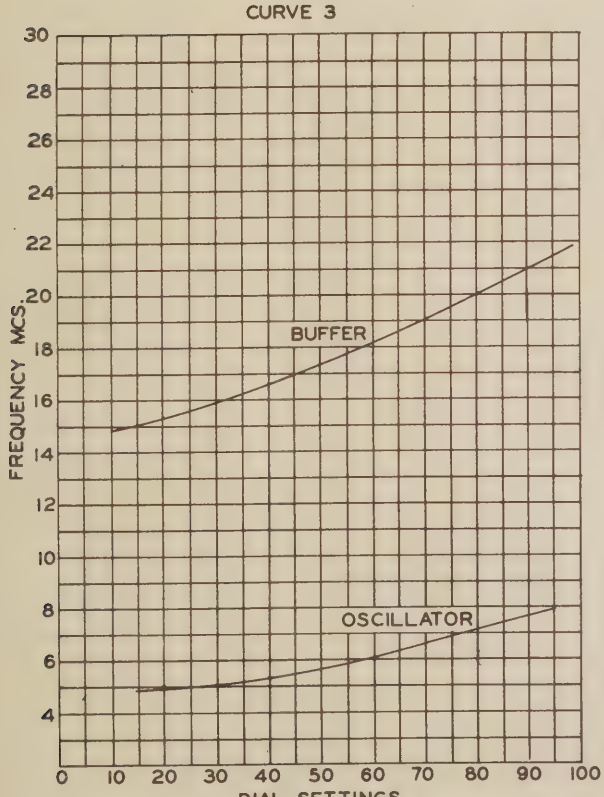
FINAL AMPLIFIER TUNING CALIBRATION
VIKING I TRANSMITTER SERIAL 397
LOADED TO FULL OUTPUT INTO 50 OHMS RESISTANCE

CURVE 2



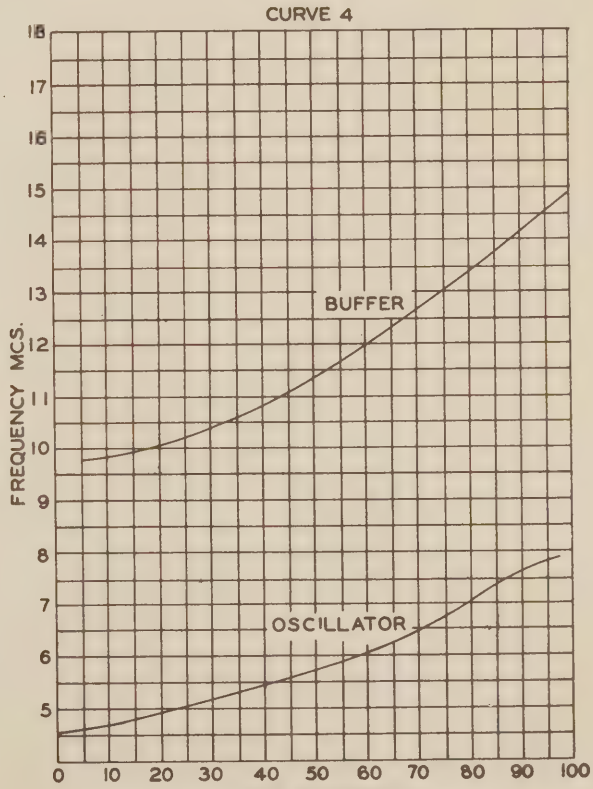
EXCITER CALIBRATION 10 METER BANDSWITCH POSITION VIKING I TRANSMITTER SERIAL 397

CURVE 3



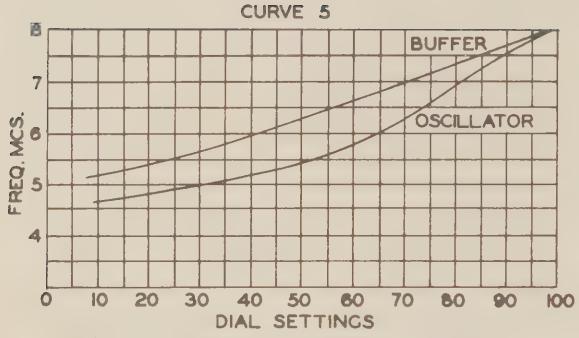
EXCITER CALIBRATION 15 METER POSITION

CURVE 4



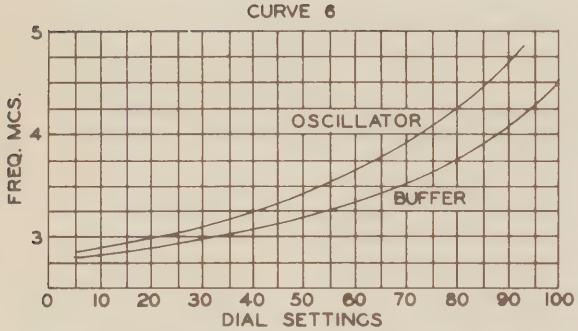
EXCITER CALIBRATION 20 METER POSITION

CURVE 5



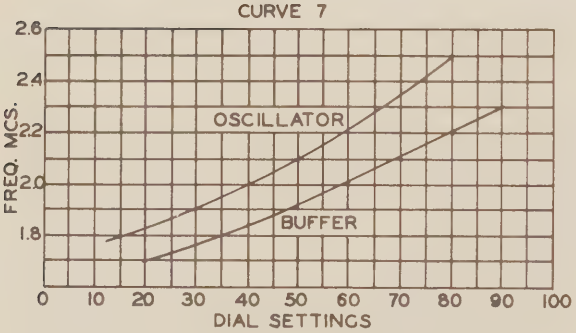
EXCITER CALIBRATION 40 METER POSITION

CURVE 6



EXCITER CALIBRATION 80 METER POSITION

CURVE 7



EXCITER CALIBRATION 160 METER POSITION

TABULATED DATA

Typical conditions, amplifier fully loaded into 50 ohms resistance

Curve #1

Freq.	Final Tuning Setting	Coarse Coupling	Fine Coupling	Remarks
30 MC	98.5	7	55	160 Meter Out
28	95	7	55	"
21	88	7	48	"
14	77	6	45	"
7	51.5	4	98	"
3.839	20	2	74	"
3.610	15	2	70	"
3.610	79	7	100	160 Meter In*
1.994	23	4	38	"
1.805.	11	3	50	"

*Not fully loaded

Curve #2

MO or XTAL Freq. MC.	Oscillator Setting	Buffer Setting	Buffer Output Freq. MC.	P.A. Grid M.A.	Minimum M.O. Voltage Required For P.A. Grid M.A.
15 MO	92	86	30	15 Plate Off	0.8 V
14	85	75	28	15 Plate Off	0.95
				10 Plate On	0.95
				15 Plate On	1.95
12.8	77	62	25.6	15 Plate Off	6.4
10.8	51	20	21.2	15 Plate Off	1.4
9.34	23				
9.07	17				
7.00 XTAL	85	75	28	16.5 Plate Off	
				13.5 Plate On	
7.00 MO	85	75	28	15 Plate Off	5.6

Curve #3

7.6 MC	88	100/	22.8		
7.0	79	85	21.0	15/	XTAL
7.0	79	85	21.0	15	2.2 V
6.0	58	58	18.0	15	7.0
5.0	25	25	15.0	15/	XTAL

Curve #4

7.3	83	93	14.6	15	1.4 V
7.0	80	86	14.0	15	1.1 V
7.0	80	86	14.0	15/	XTAL
6.0	60	61	12.0	15	1.4 V
5.0	26	16	10.0	15/	XTAL
4.95	23	98	14.85		XTAL
4.80	18	4	9.60	15	XTAL

Curve #5

8.0	100	98	8	15	1.0 V
7.6	90	85	7.6	15	.92 V
6.0	67	42	6.0	15	.45 V
5.0	34	0	5.0	15/	XTAL

NOTE: The use of 80 meter crystals and doubling in the oscillator stage is satisfactory for 40 meter operation.

Curve #6

4.53	85	100	4.53	15/	XTAL
4.00	72	87	4.00	15/	XTAL
3.5	52	66	3.50	15	.2 V
3.0	22	34	3.00	15	.25 V
2.8	5	11	2.80	15	.7 V

Curve #7

2.4	73	97	2.4	15	.3 V
2.3	65	87	2.3	15	.3 V
2.0	38	57	2.0	15	.35 V
1.9	30	50	1.9	15	.35 V
1.8	15	34	1.8	15	.45 V

ASSEMBLY INSTRUCTIONS

JOHNSON Viking I Transmitter

Success in assembling a piece of radio equipment such as the Viking I requires only that the instructions be followed implicitly, that the work be divided into sections which may be easily checked for correctness and completeness. This instruction manual was written by assembling a transmitter from standard production material and each step in the exact order of assembly described fully. It is a good plan to read over each description of the operation, perform it and then using the schematic diagram, check to see if your interpretation agrees with the schematic. As you go along you will be surprised how very familiar with the transmitter you become. Even with this, it is inevitable that some small mistakes will be made, however, by the time the transmitter is finished, these mistakes can be found readily by following the test procedure.

Mounting the front panel is postponed until one of the last operations to avoid the possibility of scratching up the panel. The parts which mount on the front of the chassis behind the front panel are equipped with two mounting nuts so that it is not necessary to remove them in order to mount the panel when that stage is reached.

Where chassis grounds are made with screws and nuts, be certain to use shakeproof washers as the etching process used in finishing the chassis leaves a small amount of oxide which increases surface resistance.

W A R N I N G

The voltages encountered in this piece of equipment are high enough to cause fatal injury! Practice safety rules until they are second nature. Always turn off the high voltage before making any adjustment inside the transmitter. Never depend on a bleeder resistor to discharge filter condensers. After the power is turned off, short circuit the high voltage circuit. Never operate the transmitter with any other than the recommended fuse in the primary circuit. The fuse will protect your equipment, in the case of accidental contact with the high voltage, it may save your life. If children have access to the transmitter, always disable the primary circuit by removing the fuse or the high voltage circuits by removing the rectifiers.

- - - - -

Be sure and return the enclosed warranty registration card. This will permit the mailing of additional information from time to time.

NOTICE

The regulations of the Federal Communications Commission require an amateur license for operation of this equipment. Refer to publications of the American Radio Relay League for the latest applicable rules.

VIKING I TRANSMITTER

Assembly Instructions

1. In order to be able to work on the transmitter in an inverted position without damaging the parts mounted above the chassis, four legs roughly 3/4" x 1-1/4" x 9" should be made of scrap wood. Four 7/32" diameter holes are provided in each end of the chassis for the 1" 10-32 machine screws and nuts supplied for bolting the legs to the chassis.

2. Mount all the tube sockets, the VFO power socket and the crystal selector socket in the positions shown on Figure 1, according to the following directions.

   a. Mount socket X5, 7 pin miniature with shield base (120-277B) using 3/16" 4-40 machine screws, with nuts on top of the chassis, shakeproof washers and nuts. It is necessary to place the nuts on top of the chassis to avoid danger of short circuits between socket terminals. A #6 solder terminal (16.104-1) should be fastened under the mounting screw nearest the outside edge of the chassis. The 6AQ5 buffer/doubler plate terminal (pin 5) should be toward the front of the chassis.

   b. Mount socket X6 also a 120-277B in the same manner with the 6AU6 oscillator plate (pin 5) toward the front of the chassis and a #6 solder terminal under the mounting screw nearest the outside edge of the chassis.

   c. Mount socket X1 (120-277B) the same way with the 6AU6 audio amplifier control grid (pin 1) toward the front of the chassis and a #6 soldering terminal under the screw nearest the end of the chassis.

   d. Mount X2 for the 6AU6 in the same way.

   e. Mount socket X11, 7 pin miniature (120-277B) for the 6AL5 bias rectifier above the chassis with plate 2 (pin 2) to the rear. Use 3/16" 4-40

screws, shakeproof washers and nuts.

f. Mount socket X4, 5 pin ceramic wafer (122-225) under the chassis with the cathode terminal of the 807 (pin 4) to the front of the chassis. Use 1/2" 6-32 screws, shakeproof washers and nuts.

g. Mount socket X3, 5 pin ceramic wafer (122-225) in the same way with the 807 screen grid terminal (pin 2) toward the front of the chassis.

2. h,i. Mount socket X8 and X9, octal ceramic wafer (122-228) for 5R4G rectifiers under the chassis with blank terminals (pin 7) to the rear of the chassis. Use 1/2" 6-32 screws, shakeproof washers and nuts.

j. Mount X7, 7 pin large shielded wafer socket (122-101-8) for the 4D32 amplifier with the control grid (pin 6) toward the chassis front. Terminals are marked on the bottom of the steatite body of the socket. Subpanel mount the socket by means of the 1/2" spacers (13.49-9) and 3/4" x 8-32 screws, lockwashers and nuts. Also use shakeproof washers under the heads of the mounting screws.

k. Mount socket X10 octal wafer (122-228) for the 5Z4 low voltage rectifier with pin 7 to the rear of the chassis. Mount with 1/2" 6-32 screws, shakeproof washers and nuts.

l. Mount X12, the octal ceramic wafer VFO power socket (122-228) on the rear edge of the chassis (on the right side with the chassis inverted) with the key slot away from the corner of the chassis. Use 1/2" 6-32 screws, shakeproof washers and nuts.

m. Mount X15, the crystal selector socket only (126-120) atop the chassis so that its numbers appear correctly from the front of the chassis. Use 1/2" 6-32 screws, shakeproof washers and nuts. The front screws need not be tightened as the nuts will have to be removed later.

3. Mount the fuse post and the six terminal strips shown in the photo Figure 2 as follows:

a. Mount the fuse post X16 on the rear edge of the chassis in the top hole beside the VFO socket X12. The body terminal should be accessible for wiring later.

b. Mount terminal board X17 a 5 terminal strip by means of 3/16" 4-40 machine screws, shakeproof washers and nuts beside the fuse post X16 with a #6 soldering terminal under the mounting nut nearest the top of the chassis.

c. Mount terminal board X18 (also 5 terminal) in the same way parallel to the front of the chassis beside the sockets for 807 modulators (X3,X4) with a #6 soldering terminal under the nut nearest the center of the chassis.

d. Mount terminal board X19 (also 5 terminal) at right angles to the front of the chassis between and slightly to the rear of the 6AU6 audio amplifier sockets (X1, X2) with a #6 soldering terminal under the nut nearest the rear of the chassis.

e. Mount terminal board X20, a 6 terminal strip by means of 3/16" 4-40 screws shakeproof washers and nuts at right angles to the front of the chassis between the 4D32 socket (X7) and the 6AU6 oscillator socket (X6) with a #6 soldering terminal under each nut.

f. Mount terminal board X21 in the same way at right angles to the front of the chassis beside pin 7 of the socket X7 with a #6 soldering terminal under the nut nearest the front of the chassis.

g. Mount terminal board X22 the same way at right angles to the front of the chassis opposite pin 1 of the 5R4 socket X9 with a #6 soldering terminal under the rear nut.

4. Make all the grounds to the chassis as follows using #20 tinned wire except where noted otherwise. The #20 wire (W2) should have the insulation stripped off for the very short leads.

a. On socket X5 for the 6AQ5 buffer ground the center shield and pin 3 to the soldering terminal under the socket mounting nut and solder.

b. Ground the center shield and pins 2 and 3 of the 6AU6 oscillator socket X6 to the soldering terminal under one of the mounting nuts and solder.

c. Ground pins 2, 4 and the center shield of socket X1 to the soldering terminal under the nut and solder all except pin 2.

d. Do the same to socket X2 and solder all connections.

e. Connect pin 1 of 5Z4 socket X10 to pin 3 and center shield of socket X11. Leave a 2 inch length at X11 to be later grounded. Solder all connections.

f. Ground pin 5 of the 807 socket X4 and pin 5 of the 807 socket X3 to the nearest #6 soldering terminal under one of the terminal board X18's mounting nuts and solder.

g. Run a 5/8" 4-40 screw thru the rivet hole in socket X7 between pins 4 and 5 and secure beneath the socket with a lockwasher and nut. Mount two #6 soldering terminals on the screw using another shakeproof washer and nut. One lug should be turned toward the solder terminal of pin 4, one toward the solder terminal of pin 5. Connect a piece of #14 tinned wire to pins 7 and 4 of socket X7 and leave 2-1/4" extending from pin 4. Solder to the socket lugs. Make certain that the lead clears all the other tube terminals.

h. Ground each end terminal of the terminal board X20 to the corresponding ground lug under the mounting nuts. Solder the ground ends only.

i. Connect the 4th terminal from the rear of terminal board X22 to the ground lug under mounting nut. Do not solder.

j. Connect the two rear terminals of X19 to the solder terminal under the mounting nut. Do not solder.

k. Using W2 wire connect pins 1 and 2 of the VFO socket X12 together and to the solder terminal under the mounting nut of terminal board X17 on the rear edge of the chassis and solder.

5. a. Mount bracket BKT 4 (16.857.2) for the 160 meter auxiliary switch SW6 atop the chassis in the position shown on Figure 1. The mounting holes are approximately 4-1/2" from the front of the chassis slightly to the right of the center. These holes are behind the pair of half-inch holes (spaced 2" apart) provided to permit the drive cable to pass thru the chassis. The horizontal edge through which the screws pass should be toward the chassis rear. Use 1/4" 6-32 binding head screws, shake-proof washers and nuts.

b. Mount bracket BKT5 (16.857-2) in exactly the same manner under the chassis in the pair of holes in front of the 1/2" cable clearance holes. See Figure 2. The horizontal edge should be to the rear.

c. Mount SW6, the 160 meter auxiliary switch on bracket BKT4 with the shaft toward the front of the chassis and indexing ball toward the left edge of the chassis. The SW6 assembly screws should be on a line perpendicular to the top of the chassis. Use a 3/8"-32 nut and 3/8" shakeproof washer.

d. Install the drive pulley D3 (23.909) on the shaft of SW6 with the hub side toward the front of the chassis. The opening in the rim should be downward (toward the chassis) with SW6 turned to its counter-clockwise position looking at the end of the shaft. The pulley should be centered over the half-inch holes provided for passing the drive cable thru the chassis.

e. Mount the shaft and bearing assembly D-15 (115-256-16) in bracket BKT5 with the shaft extending through the front edge of the chassis as shown in Figure 2. The nut should be toward the front.

f. Mount pulley D4 (23.909) on the rear end of D-15 the hub toward the front of the chassis and the rim of D4 centered over the 1/2" chassis holes.

g. Cut a 34" length of dial cord D7 (42.49-150). Slip one of the dial cord tension springs D9 on the cord, tie it in the center of the cord with an overhand knot.

h. Hook the tension spring D9 on either of the ears of D3. Check SW6 to be sure it is still in the counter-clockwise position.

i. Fasten a knob on the shaft D15 so that in the process of stringing the dial cable you can keep the pulley D4 from turning.

j. Pass one end of the cable D7 thru the break in the rim of the pulley D3, around D3 in a counter-clockwise direction looking from the front of the chassis and thru the corresponding 1/2" hole in the chassis.

k. While holding the end of the dial cable under the chassis, turn the knob on the shaft D-15 so that the break in the rim of the pulley D-4 is nearest the chassis. Holding the knob with the left hand string the cable around the pulley D4, thru the break in the rim and under the nearest ear on the pulley. Hold the pulley and dial cord with the right hand, using a screwdriver push the ear of D-4 so that it grips the dial cord. Tension need not be kept now since the critical dimensions are now set and if the cable falls off the pulleys it can be readily re-strung. Tie an overhand knot in the clamped end of the cable, slide the knot down to where the cable is clamped and draw the knot tight.

l. Twist the knob on shaft D-15 in a counter-clockwise direction so that the dial cord is now under tension. String the thus far unused end of the dial cord around the pulley D3 in a clockwise direction, thru the corresponding 1/2" hole in the chassis, around pulley D4 in a clockwise direction. Now holding D4 and the cable in the right hand clamp down the other ear of D4 over the cable. Tie an overhand knot in the end of the cable and slide it down tight against the ear and draw tight. Check the cable to make sure that there is no backlash in the switch operation and that the cable does not cross on the pulleys causing them to bind. Trim off excess length of cable, leave about 1/2 inch.

6. a. Mount bracket BKT8 (16.1001-1) atop the chassis just to the right of the socket X5 by means of a 3/8" 10-32 machine screw, shakeproof washer and nut. The bend in the bracket should be toward the front of the chassis. This is the bracket holding switch SW4 in Figure 3.

b. Locate the exciter bandswitch SW4. Looking at the rear deck of the switch from the rear and with the blank section of the switch to the left call the topmost lug #1 and the next one #2 and so on around the switch deck in a clockwise direction the last one being lug #7. Connect R21 (4700 ohms 1 watt) between lugs 1 and 4 of the rear deck, jumper lug 4 to lug 3, solder at lug 3. Connect R22 (22 ohm 1/2 watt resistor) between lugs 4 and 5, do not solder. Bend R22 back toward switch.

c. Mount SW4 in bracket BKT8 using the 3/8-32 nut and shakeproof washer. Looking from the front of the chassis, the switch should be turned so that the lugs of the rear deck are toward the left end of the chassis and the switch assembly screws on a line perpendicular to the top of the chassis.

d. Connect a jumper of SW2 wire between terminals 1 and 7 of the rear deck of SW4. Do not solder.

e. Insert one of the small grommets in the chassis hole under lug #7.

f. Slip 1/2" of spaghetti over one of the leads of R20 (100 ohms 1/2 watt) pass this lead and spaghetti thru the grommet hole from underneath the chassis and solder to lug #7 of the switch. The spaghetti is to provide good RF insulation, the grommet to prevent abrasion.

g. Considering now the front deck of SW4 looking at it from the front of the chassis, call the top most lug #1 the next one in a clockwise direction #2 and so on around the bottom lug being #7.

h. Connect a jumper of SW2 wire from lug #1 to lug #7 of the front deck. Do not solder.

i. Install a grommet in the hole under lug #7 and install R26 (100 ohms 1/2 watt) following the same procedure as in (f) above. Also slip one of the leads of C23 (.005-450V mica) into the spaghetti from under the chassis and solder to lug #7.

7. a. Mount the buffer/doubler coil L5A (23.902-2) just to the right (looking from the front of the chassis) of the rear deck of the bandswitch SW4 and directly in front of the 4D32 socket, using shakeproof washers and 6-32 nuts. The coils terminals will be toward the left end and slightly toward the front of the chassis. See Figure 4. Coils L4, the oscillator coil and L5A the buffer coil are quite similar, the difference being that the bottom 5 turns of L4 are space wound.

b. Connect the top lead of the coil L5A to lug #1 on the front deck of SW4 and solder.

c. Connect the tap of coil L5A (approximately 50 turns from the top) to lug #2 on the front deck of SW4 and solder. Use #24 tinned bare wire

for connections to the taps of L5A.

d. Connect the next lower tap on coil L5A to lug #3 of the front deck of SW4 and solder.

e. Connect the next lower tap on coil L5A to lug #4 of the front deck of SW4 and solder.

f. Connect the bottom lead of coil L5A to lug #5 of the front deck of SW4. Do not solder.

8. a. Mount the oscillator coil L4 atop the chassis by means of shakeproof washers and 6-32 nuts behind and slightly to the left of SW4 looking from the front of the chassis. Refer to Figure 5. The coil's terminals will be toward the left end of the chassis looking from the front.

b. Connect the top lead of coil L4 to terminal #1 of the rear deck of SW4 (refer to Section 6b) and solder.

c. Connect the tap (down approximately 50 turns from the top) of coil L4 to lug #6 on the rear deck of switch SW4 and solder. Wire all the taps of L4 with #24 tinned bare wire.

d. Connect the next lower coil tap of L4 to lug #3 of the rear deck of SW4 and solder.

e. Connect the tap nearest the bottom of L4 to lug #2 of the rear deck of SW4. Leave the bottom lead of coil L4 hanging for the time being.

f. Solder lugs 4 and 5 on the rear deck of SW4.

g. Insulate one lead of C19 (.005 mfd. 450 volt mica) with a 1" piece of spaghetti. Pass it between the decks of SW4 from the left end of the chassis and solder to lug #7 on the rear deck of SW4. The lead should be between the shaft and the bottom spacer of SW4. C19 will be connected later to the oscillator tuning condenser.

9. a. Mount the high frequency buffer coil L5B (23.913) in front of the

buffer coil L5A, its axis parallel to the front of the chassis and the tap to the rear, as per Figure 4. The #14 lead of L5B passes thru a hole in the chassis. Use 6-32 x 3/8" screws and shakeproof washers furnished on L5B's insulators and at the same time mount the bracket BKT6 (16.857-2) under the chassis, the edge through which the mounting screws pass toward the rear of the chassis. This bracket is for the buffer tuning condenser C22. See Figure 10, the item of C22.

b. Connect the strap on the left end of the coil L5B, looking from the front of the chassis, to lug #5 on the front deck of the bandswitch SW4 and solder.

c. Connect the tap of L5B to lug #6 on SW4 and solder.

d. Loosely fasten the excitation control R25 (25,000 ohm 4 watt potentiometer) to the bracket BKT9 (16.1001-1) by means of its mounting nut. Mount bracket BKT9 on the chassis flush with the front edge directly in front of the coil L5B, shaft of R25 to the front with a 3/8" 10-32 screw, shakeproof washer and nut. Rotate R25 so that the lugs point toward the left edge of the chassis looking from the front, as seen in Fugure 4. Tighten the nut on R25.

e. Check to make sure all joints in the buffer compartment are soldered.

10. a. Using 1/4" 6-32 binding head screws, shakeproof washers and nuts fasten shield S4B (17.755) to shield S4A (17.756). In order to see the positions of these shields slip the smaller of the shields between the decks of SW4. The slot in the small shield will clear the switch. Place the larger of the shields atop the chassis the edge having punched holes down. The shield will fit between the 4D32 socket and the oscillator coil L4, between the buffer coil L5A and the 4D32 socket. The front edge of the shield will be beside the potentiometer R25. After

Screwing the shields together put them back in the position just described and note the locations of the mounting holes for the shields which coincide with the holes punched in the lower edge of the shields. Using 1/4" 6-32 binding head screws, shakeproof washers and nuts fasten the 6-32 spade lugs to the shields being careful to get spade lug on the correct side of the shields. This can be seen by referring to Figures 4, 5 and 7. The shields will fit nicely into the 7 holes provided without the necessity of distorting the shape of the shields. Secure the shields under the chassis with 6-32 nuts and shakeproof washers. The job is simplified if the spade lugs are not particularly tight. The spade lugs can then be moved slightly in order to get them into their respective holes. The screw holding the spade lug near the buffer coil L5A must be inserted in the shield screwhead toward L5A otherwise the coil will be scraped in assembly. Mount a # 6 soldering terminal under the spade lug nut nearest pin 4 of socket x7. Trim and solder the # 14 wire extending from pin 4 to this ground terminal.

b. Mount the oscillator tuning condenser C18167-104-2 (75L15 JOHNSON) on the hole in the shields next to the switch SW4 stator section toward the chassis as shown in Figures 4 and 5. The contact of C18 should be turned 90 degrees toward the center of the chassis.

c. Connect the .005 mica condenser C19 previously connected to lug #7 of the rear deck of SW4 to the rotor terminal of C18 and solder.

d. Install a grommet in the hole beside the 6AU6 oscillator tube socket X-6.

e. Connect the bottom lead of the oscillator coil L4 and a 2" length of wire W2 to the nearest stator terminal of C18 and solder. Run the wire W2 thru the grommet just installed in (d).

f. Slip the split sleeve coupling D18 on the shaft of C18. Slide the 1/4 x 2 1/4" shaft extension D13 into the coupling from the front. Center the ends of the shafts in the coupling D18 and secure.

11. a. Mount the final inductor L9 atop the chassis in exact center over the six ventilation holes near the front edge. The front of the inductor is the end where the spacing between turns is least and should be toward

the front edge of the chassis. Use 3/8" 8-32 screws, shakeproof washers and nuts.

b. Connect a piece of #14 tinned wire between the solder terminal on the front end of L9 and one of the flat #10 solder terminals furnished, on the 8-32 screw terminal on the same end of the inductor.

c. For convenience in shipping the tuning mechanism BKT1 (23.900-1), the gear which will be later used to drive the condenser C29, has been fastened to the inductor drive shaft and pinion. This gear should be removed so that the drive shaft is free to slide back and forth in its bearing. Mount the flexible coupler D16 (104-250-51) on the drive shaft on the end next to the small gear.

d. Loosen the other pair of set screws in the flexible coupler D16, mount the tuning mechanism BKT1, the outside of the bend in the bracket to the front of the chassis. BKT1 mounts directly in front of the final inductor L9, the rear end of the flexible coupler D16 over the shaft of L9. Use 3/8 10-32 screws, shakeproof washers and nuts.

e. Loosen set screws in the flexible coupler D16 and adjust its position on the shafts so that it can move freely and take care of any slight misalignment of the shafts. Tighten all four set screws in D16.

f. Mount BKT2 (17.754-1) behind the final tuning inductor L9 outside of the bend in the bracket toward the right edge of the chassis looking fron the front. Refer to Figure 6. Use 3/8" 10-32 screws, shakeproof washers and nuts.

g. Mount bracket BKT3 (17.752-1) between brackets BKT1 and BKT2 using 10-32 screws and shakeproof washers. Loosen the top bearing in BKT1 but do not remove.

h. Take the gear removed from the drive shaft of BKT1 hold it behind the

top bearing in BKT1, hub side to the chassis rear, set screws up and with the gear teeth in mesh with the small gear near the center of BKT1. Pass the shaft of condenser C29 (154-2-3) thru the hub of the gear and the bearing in BKT1. Permit C29 to rest on the final inductor L9.

i. Fasten the mounting feet provided in the hardware envelope Hw. 438 (23.08-1) on the variable condenser C30 (350E20).

j. Pass 1/2" 6-32 screws thru the mounting feet on C29, thru the holes in brackets BKT3 and thru the mounting brackets of C30. Fasten with shakeproof washers and nuts. The long shaft of C30 should be toward the front edge of the chassis.

k. With the roller of the inductor L9 at the front stop and with C29 fully meshed, adjust the position of the gear on the shaft of C29 so that the groove in the gear's hub clears the gear below and tighten set screws.

l. Tighten the top bearing in BKT1. Attach a knob temporarily to the final tuning shaft and check to see wherher or not this tuning assembly turns freely. If not, loosen the mounting screws of various components and realign. A drop of oil on the bearings of BKT1 on the outside ends of the bearings of L9 and the variable condenser C29 will aid in making the tuning smooth.

12. a. Using bracket BKT10, a 3/8" 10-32 screw, nut and shakeproof washer, mount the coupling switch SW5, as shown on Figure 3, directly under the front shaft of the output coupling condenser C30. The assembly screws should lie on a line perpendicular to the top of the chassis, the blank side of the switch to the left of the chassis looking from the front.

b. Attach two #6 soldering terminals to the front of the frame of the

output tuning condenser C30, as seen in Figure 6, one under the screw in the condenser mounting bracket nearest the condensers shaft, the other under the screw nearest the chassis on the right (lower frame rod). Connect a piece of #14 wire between these lugs and solder.

c. Starting with first lug to the right of the top screw in the switch SW5 (looking from the front), connect condensers C33, C34, C35, (300 mmf. 450 volt mica) each to one of the switch terminals around the switch in a clockwise direction from the front except the last three terminals. To the last lug connect C38 (150 mmf. 1200V mica). Connect C36 and C37 each 600WV mica to the two switch lugs still open. The other lead of all the condensers connect to the #14 wire on condenser C30 covered in operation 12-b. Solder all connections.

d. Fasten a #6 solder terminal under the nut of the bottom, front stator terminal of the output tuning condenser C30. Between this terminal and the two lugs on the top of SW5 (to the left of the top screw) connect a piece of #14 wire and solder.

13. a. Under convenient screws in the rear of the frames of condensers C29 and C30 connect a #10 soldering terminal on each condenser. Connect parallel #14 wires as short as possible between these lugs and solder. This is to provide a good low resistance bond between the two condensers.

14. a. Looking at the 160 meter switch SW6 from the rear of the chassis, as in Figure 6, call the first lug to the right of the tap nut (used in assembling the switch) terminal #1. Call the others in order in a clockwise direction #2, #3 etc., around to the one just to the left of #1 which will be #12.

b. Fasten a #10 soldering terminal under the 8-32 screw terminal on the rear of the final inductor L9 and connect a piece of #14 wire

between this terminal and terminals #2 and #3 on the 160 meter switch SW6 and solder.

c. Connect a #10 soldering terminal on the bottom rear stator terminal of the coupling condenser C30. Solder a piece of #14 wire between this terminal and terminals #11 and #12 of the 160 meter switch SW6.

d. Mount the 160 meter auxiliary inductor L10 (23.902-3) atop the chassis directly behind switch SW6, as shown in Figure 7, and with the leads toward SW6. Secure with shakeproof washers and 6-32 nuts.

e. Solder the top terminal of L10 to terminals #5 and #6 of the switch SW6.

f. Solder the bottom terminal of L10 to terminals #8 and #9 of SW6. Terminals #1, #4, #7 and #10 will be left blank.

15. a. Using a 6-32 x 1/4" binding head screw and shakeproof washer, fasten bracket BKT13 to the plate coupling condenser C31 (.002 mfd. 1200WV mica) so that the bend in the bracket is parallel to the long axis of the condensers. See C31 in Figure 7.

b. Mount the bracket BKT13 on the bottom rear stator terminal of the tuning condenser C29 so that the condenser C31 projects upward. To this same terminal on C29 and at the same time mount the residual high frequency coil L8 (23.911) as shown in Figure 7, by means of its soldering terminal attached. Solder the plain wire end of L8 to the rear soldering terminal of the final inductor L9.

c. Mount the rf choke L7 (102-754) behind the 4D32 socket X7, using 1/4" 6-32 binding head screws, shakeproof washers and nuts. The bottom terminal of choke L7 should be to the rear of the chassis.

d. Fasten two #6 soldering terminals to the top end of the coupling condenser C31 by means of a 1/4" 6-32 screw and shakeproof washer. To,

one of the terminals solder a piece of #14 wire; the other end of the wire to the top terminal of the choke L7. To the other solder terminal on C31, solder the parasitic suppressor L11 (23.912). The suppressor lead to the C31 terminal should be as short as possible.

e. To the other end of L11 solder the 4D32 plate connector TC1 (119-854).

f. Mount the plate by-pass condenser C32 (.01 mfd. 1200 WV mica) atop the chassis behind the final inductor L9 in the position shown on Figure 7 the center line between the tapped holes of the condenser parallel to the front edge of the chassis. Mount the condenser by means of a 6-32 x 1/2" screw run thru a shakeproof washer, up thru the chassis and thru a 10-32 nut used for a spacer.

g. Fasten by means of a 1/4" 6-32 binding head screw a #6 soldering terminal to the end of C32 nearest the rf choke L7 and solder a piece of #14 wire between this terminal and the bottom terminal of L7.

h. Install a grommet in the hole directly behind L7.

16. a. Lay the wiring harness WI (26.182) in the chassis as shown in the illustration #8. Some of the leads in the harness will prove to be slightly long and may be trimmed to fit. For this reason the leads are not stripped. The plastic covering of the wire may be readily stripped using diagonal cutters, a knife or a wire stripper such as the General Cement #733A. An iron applied directly to the insulation will cause it to melt but the iron can be left on joints long enough for the solder to flow without affecting the insulation. Numbers of the leads of the wiring harness are given in the drawing Figure 11.

b. Connect green leads 13A and 14A to pin #1 of the 4D32 socket X7 and solder.

c. Connect orange lead 5B to the lug of the terminal strip X21 nearest

the front of the chassis. Do not solder.

d. Connect the white leads 6B and 21B to the fourth lug from the front of the chassis on terminal board X21. Do not solder.

e. Connect lead 22A black to the third terminal from the front of terminal board X21. Do not solder.

f. Connect the black-brown lead 23A to the second terminal from the front of terminal board X21. Do not solder.

g. Connect lead 47B (gray) to pin #2 of the 4D32 socket X7. Do not solder.

h. Run lead 49B (green-white) thru the grommet beside the rf choke L7 and solder it to the bottom terminal of L7.

i. Connect 39B and 40A, both violet, to the cathode terminal (pin 4) of the 807 socket X3 and solder.

j. Solder leads 14B and 15A, both green, to the filament terminal (pin #1) of the 807 socket X3.

k. Solder leads 45B and 46A, both yellow-blue, to the screen grid terminal (pin #2) of the 807 socket X3.

l. Solder lead 15B (green) to the filament (pin #1) of the 807 socket X4.

m. Solder lead 40B (the longest violet lead) to the cathode terminal (pin #4) of the 807 socket X4.

n. Solder lead 46B (yellow-blue) to the screen grid (pin #2) of the 807 socket X4.

o. Connect lead 22B (black) to the fourth lug from the edge of the chassis on terminal board X18. Do not solder.

p. Connect lead 43B (violet) to the terminal of the terminal board X18 nearest the edge of the chassis. Do not solder.

q. Connect leads 48B and 49A (both green-white) to the second terminal from the edge of the chassis on terminal board X18. Do not solder.

r. Connect leads 7B and 38A (both yellow) to the fifth terminal from the rear of the chassis on terminal board X22. Do not solder.

s. Connect leads 8B and 39A (both violet) to the lug of terminal board X22 nearest the center of the chassis. Do not solder.

t. Connect leads 27B and 28A (both black-brown) to the rear terminal of the terminal board X22. Do not solder.

u. Connect lead 32B (gray-red) to the second terminal from the rear of terminal board X22. Do not solder.

v. Connect lead 42A (violet) to the #1 pin of the forward 5R4 socket X9. Do not solder.

w. Connect lead 20B (green) to pin #3 of the 6AU6 socket nearest the corner of the chassis (X1) and solder.

x. Connect lead 9A (red) to the center terminal of terminal board X19. Do not solder.

y. Solder leads 19B and 20A (both green) to the #3 pin of the 6AU6 socket X2.

z. Install a grommet 22.113-1 in the hole between and in front of socket X1 and X2. Run leads 1A, 2A, 3A, 4A, 5A, 6A, 7A and 8A for connection later to the meter switch SW7.

aa. Solder lead 4B (black) to terminal under mtg. nut of socket X2.

17. a. Connect lead 25B (white) to the 6AQ5 buffer screen grid terminal pin 6 of socket X5 and solder.

b. Solder lead 3B (gray) to the cathode terminal of the 6AQ5 buffer pin 2 of socket X5.

c. Solder leads 17B and 18A (both green) to the filament terminal pin 4 of the 6AQ5 buffer socket X5.

d. Solder leads 16B and 17A (both green) to the filament pin #4 of the

6AU6 oscillator socket X6.

e. Solder lead 10B and 12A (both red) to pin #3 of the octal VFO power socket X12.

f. Solder leads 13B and 16A (both green) to pin #7 of socket X12.

g. Solder leads 23B and 24A (both black-brown) to pin #5 of socket X12.

h. Solder lead 50B (brown) to pin #8 of socket X12.

i. Connect lead 12B (red) to pin #3 of the 5Z4 rectifier socket X10. Do not solder.

j. Connect lead 29A (white) to the 4th terminal from the bottom edge of the chassis on terminal board X17. Do not solder.

k. Connect lead 31B (blue-orange) to the lug of terminal board X17 nearest the edge of the chassis. Do not solder.

l. Connect lead 27A (black-brown) to the center terminal of the board X17. Do not solder.

m. Using a short piece of the insulated hookup wire W2 connect lead 29A (white) on the terminal board X17 to the end lug of the fuse post X16. Solder.

n. Connect lead 1B (blue) to the cathode of the 6AU6 oscillator pin 7 of socket X6 and solder.

o. Connect lead 9B, 10A and 11A (all red) to the 3rd and 4th terminals from the front of the chassis on terminal board X20 and solder.

p. Connect lead 24B (black-brown) to the second terminal from the front of the chassis on terminal board X20. Do not solder.

q. Connect lead 34A (brown) and 50A (brown) to the 5th terminal from the front of the chassis on terminal board X20. Do not solder.

r. Install a grommet 22.113-1 in the hole directly under the excitation control R25 and bring up the leads for the excitation control to the

top of the chassis.

18. a. Using a bracket BKT11 (16.1001-1), a 3/8" 10-32 screw, shakeproof washer and nut, mount the meter switch SW7 atop the chassis on the extreme right hand end looking from the front. Do not use the shakeproof washer. Mount the switch so that the center line thru the switch assembly screws is perpendicular to the top of the chassis. The switch is symmetrical and may be turned so that either screw is toward the top. Looking at the switch SW7 from the rear, call the first lug to the right of the top screw lug #1, the next in a clockwise direction #2 and so on around the switch, the last one being lug #12.

b. Solder the brown lead to lug #6.

c. Strip 1-1/2" of insulation off the black lead, connect to lug #5, slip a piece of spaghetti over the exposed lead and solder to lug #9 also.

d. Connect the orange lead to lug #4 and solder.

e. Solder the yellow lead to lug #3, also to lug #2.

f. Solder the violet lead to lug #8.

g. Solder the white lead to lug #10.

h. Solder the gray lead to lug #11.

i. Solder the blue lead to lug #12.

j. Solder a 4" length of the hookup wire W2 to lug #7. This will later connect to the negative terminal of the meter.

k. Solder a 3" length of the wire W2 to lug #1, tag it in some manner so you can remember it connects to the positive terminal of the meter.

19. Wire the excitation control R25 as follows:

a. Connect the white wire to the center lug. Solder.

b. Looking from the front of the chassis, solder the black wire to the lug next to the center lug in a clockwise direction (top lug).

c. Solder the red wire to the lug next to the center lug in a counter-clockwise direction.

20. a. Mount bracket BKT12 atop the chassis outside of bend to the front between the switch SW7 (meter switch) and switch SW5 (output coupling switch) using a 3/8" 10-32 screw, shakeproof washer and nut.

b. Slip pulley D-5 on the long end of the bearing and shaft assembly D14 (115-256-15) hub side of D7 toward the bearing.

c. Slip D14 into the hole in BKT12 and secure with one of 3/32" mounting nuts. Do not use the nut furnished with D14, it is too thick.

d. Adjust the position of the pulley D5 on the shaft of D14 so that it clears the shield base of the socket X2 by 1/4" or so.

e. Slip pulley D6 (23.909) on the front shaft of the output coupling condenser C30, the hub to the rear. Adjust the position of the pulley so that it lines up with the pulley D5 with the opening in the rim toward the pulley D5 with the condenser C30 at full capacity.

f. With the pulley D5 turned so that the opening in its rim is toward SW-5, run a 1" 8-32 screw thru the topmost outside hole stamped in the pulley. Pass the screw thru the pulley from rear to front. Secure with a shakeproof washer and nut. This is the stop for the drive assembly.

g. Readjust the position of D5 on the shaft D14 so that the end of the screw installed in 20.f. is exactly flush with the front edge of bracket BKT12.

h. Now making use of the stop just provided, install the drive cable in exactly the same manner as the drive cable for the 160 meter switch

SW6 described in part 5-h. thru m. The tension spring should be fastened to the pulley D5 on the shaft assembly D14.

21. a. Mount the voltage divider R13 directly behind the 4D32 socket parallel to the front of the chassis, as shown in Figure 10. One of the resistor's mounting feet mounts under the screw for the plate by-pass condenser C32 which is on top of the chassis. Mount the other foot with a 1/4" 6-32 binding head screw, shakeproof washer and nut.

b. When the resistor was shipped from the factory, the shape of the tap was deliberately distorted so that it does not make contact with the resistance. This tap must be taken off the resistor, re-shaped and put back on the resistor. Tighten the tap carefully so as not to damage the fine wire with which the resistor is wound. Do not attempt to move the slider without first loosening it!

c. Connect the three violet wires 42B, 43A and 44A to the voltage divider R13 terminal nearest the center of the chassis. Solder.

d. Solder wire 41A (gray-red) to the tap on R13.

e. Solder wire 38B (yellow) to the end of the voltage divider nearest the edge of the chassis.

22. a. Mount the phone/CW switch SW3 in the center of the front edge of the chassis with the center line between the two screws used in the assembly of the switch perpendicular to the top of the chassis. Do not use shakeproof washer supplied. Note that the switch SW3 is symmetrical and that all the lugs are in groups of three. In order that you may stay properly oriented in wiring the switch, number any one of the center lugs of one of the groups of three lugs #1. Looking at the switch from the rear call the next lug in a clockwise direction #2 and so on, the last lug being #9.

b. Solder leads 2B and 34B (brown) to #1 terminal of the phone/CW switch SW3.

c. Solder lead 36A (blue) to lug #2.

d. Solder lead 45A (yellow-blue) to lug #3.

e. Solder lead 41B (gray-red) to lug #4.

f. Connect lead 47A (gray) to lug #5. Do not solder.

g. Connect the screen dropping resistor R-28 (10K ohms 20 watts) between lugs #5 and #6 of switch SW3. Use these lugs to support the resistor using a piece of #14 wire for one of the leads.

h. Solder lead 48A (green-white) to lug #7 of switch SW3.

i. Solder lead 44B (violet) to lug #8.

j. Solder lead 35A (orange) to lug #9.

23. a. Mount the high voltage indicator socket X13A (147-620) on the front edge of the chassis directly beneath the shaft which drives the 160 meter switch SW6 using a 1/4" 6-32 binding head screw, shakeproof washer and nut.

b. Connect lead 28B (black-brown) to one of X13's lugs, 33B (gray-red) to the other terminal and solder. Polarity need not be observed.

24. a. Mount the low voltage indicator socket X14A (147-600) on the front edge of the chassis beneath the excitation control R25 using a 1/4" 6-32 binding head screw, shakeproof washer and nut.

b. Solder leads 18B and 19A (both green) to one of X14A's lugs.

c. Solder a piece of wire W2 to the other lug of X14A, run it to the terminal under the front mounting nut of terminal board X21. Do not solder.

25. a. Mount the keying jack J2 in the front edge of the chassis directly under the bandswitch SW4 with the solder lugs of J2 toward the right

edge of the chassis, as in Figure 10. Discard the washer.

b. Solder the black lead 26B to the lug of J2 nearest the front edge of the chassis and also to the heavy lug which is part of the frame of the jack.

c. Solder the blue lead 36B to the lug of J2 nearest the top of the chassis.

26. a. Mount the bracket BKT7 (16.857-2) under the chassis on the front screws of the crystal selector socket X15 with the outside of the folded edge to the front of the chassis.

b. Using #24 tinned wire, connect the inside terminals of crystal positions 1, 2, 3, 4 and 5 on socket X15 all in parallel. This is done by running the wire parallel to the edge of the chassis thru each of the terminals and soldering.

c. In the same way connect the inside terminals of crystal positions 6, 7, 8, 9 and 10 in parallel.

d. Connect these two wires together using a piece of #24 wire running from the terminal #5 to terminal #6.

e. Mount the crystal selector switch SW8 (22.628) on the bracket BKT7 the shaft toward the front edge of the chassis. The switch should be turned so that the rotor terminal of the switch is up when the chassis is in an inverted position. Lugs 1 and 7 (see Next step) should be in a vertical line.

f. Looking at the switch from the rear, call the rotor lug #1 and the next lug in a clockwise direction #2 and so on around the switch, the last lug being #12.

g. Using #24 wire connect and solder switch lug #6 to the terminal of crystal position 6 on the outside edge of the crystal board.

h. In the same way connect and solder lug #7 of the switch to terminal of crystal position 5 on the outside of the crystal board.

i. Connect switch lug #5 to crystal position 7.

j. Connect switch lug #8 to crystal position 4.

k. Connect switch lug #4 to crystal position 8.

l. Connect switch lug #9 to crystal position 3.

m. Connect switch lug #3 to crystal position 9.

n. Connect switch lug #10 to crystal position 2.

o. Connect switch lug #2 to crystal position 10.

p. Connect switch lug #11 to crystal position 1. Lugs 1 and 12 on the switch are left unconnected for the time being.

q. Install one of the panel bearings D17 (13.123-7) in the hole in front of the chassis in line with the socket X5. The panel bearing should have one of the shakeproof washers off one of the switches behind the chassis for a spacer. The threaded portion of the bearing should extend thru the chassis to the front. Secure with one of 3/32" thick 3/8"-32 nuts.

r. Slip one of the split sleeve couplings D19 (104-258) on the shaft of the crystal selector switch SW8.

27. a. Mount the low voltage switch SW1 (SPST toggle switch) in the hole on the front of the chassis nearest the bottom of the chassis and between the phone/CW switch SW3 and the indicator socket X14A. Using one of the hexagonal 3/32" thick 3/8" x 32 nuts. The lugs should be toward the top of the chassis.

b. Solder the white lead 29B to one of the switch terminals, the lead 30A (blue-orange) to the other switch terminal.

28. a. Mount the high voltage switch SW2 (DPST toggle) perpendicular to the

top of the chassis using one of the 3/32" x 3/8" x 32 nuts in the hole nearest the top of the chassis between SW3 and the high voltage indicator X13A.

b. Connect lead 30B, also 31A (both blue and orange)to one of the center lugs of SW2.

c. To the terminal of SW2 nearest the top of the chassis and in line with the lug previously connected, solder leads 32A and 33A (both gray and red).

d. Solder the black lead 37A to the other center lug of SW2.

e. Connect the orange lead 35B to the lug of SW2 nearest the chassis and in line with the lug connected to the black lead previously. Solder.

29. Mount the buffer tuning condenser C22 167-104-3 on the bracket located under the chassis beneath the excitation control R25, shown in Figure 10 as follows:

a. Slip the shaft of C22 thru the hole in the bracket toward the front of the chassis. Slide one of the 3/32" x 3/8" -32 nuts over the shaft

b. Tighten the nut on C22.

30. a. By pushing back on the solder lug of the rotor contact of C22 turn the contact so that the lug points toward the right hand end of the chassis.

b. Solder the .005 mica condenser C23 to this lug.

c. Solder the coupling condenser C25, 50 mmf. mica (consists of two 25 mmf. silver mica in parallel) between the left hand stator terminal of C22 and lug 6 of the 4D32 socket.

d. Solder the #14 lead of the auxiliary coil L5B which comes from the top of the chassis and a piece of W2 wire to the right hand stator terminal of C22. Be sure the #14 coil lead does not touch the chassis.

e. Solder the W2 wire to pin 5 of the buffer socket X5. Since this is an RF lead, keep it in the clear so it does not touch other objects.

f. Connect the 100 ohm 1/2 watt resistors R20 and R26 both to the third terminal from the front of the chassis on terminal board X20.

31. Operations 31, a thru o, can be seen on Figure 10.

a. Connect the W2 wire from the stator terminal of the oscillator tuning condenser C18 and the 50 mmf. silver mica condenser C20 to pin 5 of the oscillator socket X6 and solder.

b. Connect the other end of C20 and one end of R23, 50k ohms 1/2 watt resistor to the grid terminal of the 6AQ5, pins 7 and 1 of socket X5 and solder.

c. Connect the other end of R23 to the second terminal from the front of the chassis on terminal board X20. Do not solder.

d. Install a #6 soldering terminal under the spade bolt of the oscillator shield nearest the right hand edge of the chassis. Between this terminal and pin 2 of the 6AQ5 socket X5, solder C27, .005 mica 450 volts and SH5, 2.2 ohms 1/2 watt resistor.

e. Beside the left side of the terminal board X20 connect and solder the .005, 450 volt mica condenser C24 between the second terminal from the front on X20 and the ground lug under the front mounting

nut of X20.

f. Solder the .005 mfd., 450 volt mica condenser C26 between the filament pin of the 6AQ5 buffer pin 4 of socket X5 and the ground lug under the front mounting nut of terminal board X20.

g. Solder the .005, 450 volt mica condenser C21 between pin #6 of the 6AQ5 socket X5 and the front terminal of terminal board X20.

h. Connect the 50 mmf. mica condenser C14 to the closest of the common terminals of the crystal selector socket X15. Insulate the lead with spaghetti, solder.

i. Solder the other end of C14 and one end of the 1 watt 65,000 ohm resistor R19 to pin 6 of the 6AU6 socket X6.

j. Solder the other end of R19 to the third terminal from the front of the chassis on X20.

k. Solder the .005 mfd. 450 volt mica condenser C17 between the fourth terminal from the front of the chassis on terminal board X20 and the ground lug under the rear mounting nut of X20.

l. Solder C15, .005 mfd. 450 volt mica between pin 7 of socket X6 and the ground terminal on the rear of X20.

m. Solder C16, .005 mfd., 450 volt mica condenser between pin 4 of socket X6 and the ground terminal at the rear of X20.

n. Solder R18, 470k ohm 1/2 watt resistor and W2 wire to pin 1 of socket X6. Connect the other end of R18 to the ground terminal on the socket X6. Connect the other end of the W2 wire lead to the rotor terminal of the crystal selector/switch SW8. Keep this lead in the clear so it does not touch other objects.

o. Connect shunt SH5, 5 ohms 1/2 watt resistor between #7 pin of X6 and 5th terminal of X20 from front. This completes the wiring for the

oscillator and buffer stages except for the VFO input lead.

p. Slip the 1/4" x 5-1/2" shaft extension D11 (14.145-7) into the coupling D19 on the crystal selector switch SW8 center the ends of the shafts in the coupling D18 and secure.

32. a. Strip 2" of the outside vinylite covering from item G2 (71.32-178) RG59U cable used for VFO input lead. Push the shield braid back exposing the vinylite insulated center conductor. Strip the insulation back 1/4" on the center conductor and tin with solder. Fill the solder terminal of J3 (one of the Amphenol 83-IR receptacles) with solder. Slide the hood H2 on the cable, the extruded end of the hood under the shield braid. Place the receptacle J3 in the hole on the rear of the chassis below the fuse post, the threaded end inserted through the hole from the inside of the chassis. If necessary, secure the receptacle temporarily using 3/16" 4-40 screws. Heat the solder lug of J3 and melt the solder, push the tinned end of the cable G2 into the lug and remove the iron immediately. Slide the hood down the cable to the chassis, fasten hood and receptacle with two 3/16" 4-40 screws, shakeproof washers and nuts. Slide the shield braid down over the hood and solder. Solder the braid a little at a time so that the hood and braid can cool down and the insulation will not be melted.

b. Strip three inches of the vinylite covering of the cable G2 from the other end. Cut the now exposed shield back 3/4" from the end being careful not to damage the insulation underneath. Solder a piece of the W2 hookup wire to the shield braid at the point where the outer covering was cut. Lay the cable G2 along the edge of the

chassis near the crystal socket X15 and solder the W2 wire to the ground terminal under the mounting nut of socket X6. Strip the insulation on the center conductor of G2 back about a quarter inch and solder to lug 12 of the crystal selector switch SW8. Looking at the switch from the rear and calling the rotor lug #1, this is the 12th lug in a clockwise direction. Carefully tin the end of the shield with solder being careful not to melt the insulation.

33. a. Connect C40, .005 mfd. 450 volt mica condenser between pin 1 and pin 5 of the 4D32 socket X7. Run the lead at pin 5 also thru one of the solder terminals mounted there and solder at the terminal and pin 5 only. Do not solder at pin 1 as yet.

b. Using 1/4" 6-22 binding head screws, fasten 1" of the W2 hookup wire stripped on each end of the condenser C28 (.002, 1200 WV mica). With the wire leads toward the chassis run these leads thru the lugs on pin 2 of X7, pin 4 of X7 and thru the solder terminal beside pin 4. Draw the condenser down tightly and solder at all points.

34. a. Place resistor R27, 2000 ohms, 1 watt and R24, 2700 ohms, 1 watt, on the chassis beside terminal board X21 and connect both between each of the end terminals of X21. Do not solder.

b. Connect shunt SH4, 1/2 watt, 5 ohms between the front terminal of X21 and the fifth terminal from the front of the chassis on X21. SH4 should be on the same side of X21 as R27. Do not solder.

c. On the same side of X21, connect R17, 2700 ohms, 1 watt resistor between the third and fifth terminals from the front of the chassis on terminal board X21. Use the excess length of the lead of R17 connected to the fifth terminal to also connect to the fourth terminal from the front. Do not solder.

d. On the other side of X21, connect R15, 1500 ohms, 1 watt resistor between the second terminal from the front of the chassis on X21 and the ground soldering terminal under the mounting nut of X21 toward the front of the chassis. Solder the ground terminal.

e. On the same side of X21, between the second and third terminals from the front of the chassis on X21, connect R16, 820 ohms, 1 watt. Do not solder.

f. Between the terminal of terminal board X21 nearest the front of the chassis and pin 7 of the 4D32 socket X7 connect C39, .005 mfd. 150 volt mica condenser and solder.

g. Between the rearmost terminal of X21 and pin 6 of the 4D32 socket X7 solder the RF choke L6 (102-750). It will be necessary to attach a short length of W2 wire stripped to make the choke reach between these terminals.

h. Solder the connections on terminal board X21.

35. The modulation transformer has dual secondary windings, normally series connected by instructions b, c, and d immediately following. If 500 ohm unbalanced audio output is desired, as for driving a power amplifier, substitute b,c, and d in the box below for parallel secondary connection.

a. Mount the modulation transformer T4 (SNC P1992) atop the chassis between the meter switch SW7 and the 807 sockets X3 and X4, as shown in Figure 9, using 3/8" 8-32 screws, shakeproof washers and nuts.

b. Cut both the green/yellow and the red wire to length and solder to the left hand terminal of X18.

c. Trim the yellow wire of T4 to length and connect to the second terminal from the left on X18. Do not solder.

d. Cut to length both the red/yellow and green wires of T4 and solder to the center terminal of X18.

For 500 ohm audio output only.

b. Cut the red wire to length and solder to the left hand terminal of X18 and also the next terminal on the right.

c. Cut both yellow and the green leads to length and solder to the center terminal of X18.

d. Trim the red/yellow and green/yellow leads to length and solder to the ground terminal on the right mounting screw of X18.

The 500 ohm output can now be obtained between the center terminal of X18 and ground. The only other change required is shown in 44 r.

e. Install a grommet 22.113-1 in the hole between the 807 sockets X3 and X4. Run the brown and blue transformer leads thru the grommet to the top of the chassis.

36. a. Mount the high voltage transformer T1 (SNC P1781) in the corner of the

chassis between the 807 sockets and the 5R4 sockets X8 and X9 using 3/8" 8-32 screws.

b. Trim the black leads of TI to length and solder one lead to each of the two rearmost terminals of terminal board X22.

c. Solder the red-yellow lead of TI to the second terminal from the front of the chassis on terminal board X22.

d. Connect one of the red leads of TI to pin 4 of the 5R4 socket X8. Do not solder.

e. Connect one of the red leads of TI to pin #6 of the 5R4 socket X9.

f. Using W2 hookup wire connect sockets X8 and X9 in parallel as follows:

Pin 6 of X8 to pin 6 of X9 and solder.

Pin 4 of X8 to pin 4 of X9 and solder.

Pin 2 of X8 to pin 2 of X9 and solder only at X9.

Pin 8 of X8 to pin 8 of X9 and solder only at X8.

g. To make a neat job the leads of TI may be now laced up with lock-stitch (waxed linen string).

37. -Before mounting the choke LI (SNC P1783) between the 5R4 sockets X8 and X9 and the 5Z4 socket X10, note that there is a small hole in the chassis inside the square formed by the mounting holes of the choke. Insert a 1/4" 6-32 screw into this hole from the top of the chassis and fasten loosely with a nut.

a. Mount the choke LI atop the chassis using 3/8" 8-32 screws, shake-proof washers and nuts. See Figure 9.

b. Connect one of the leads of the choke to pin 1 of socket X9. Do not solder.

c. Connect the other choke lead to pin 8 of socket X9 and solder.

38. a. Mount the filter choke L3 (SNC P1784) under the chassis in front of

the fuse post, the choke parallel to the rear edge of the chassis. Secure only the end of the choke nearest the right hand end of the chassis using a 1/4" 6-32 binding head screw, shakeproof washer and nut.

39. a. Mount the transformer T2 (SNC P1782) atop the chassis on the rear right hand corner as seen in Figure 9, using 3/8" 8-32 screws, shakeproof washers and nuts. Secure the loose end of L3 at the same time. The red leads of the transformer should project thru the 5/8" hole in the chassis nearest the corner. Allow some slack in all the leads of T2 so that they may be later cabled.

b. Solder one red lead of T2 to pin 4 of the 5Z4 socket X10.

c. Solder the other red lead of T2 to pin 6 of X10.

d. Solder one of the brown leads of T2 to pin 2 of X10.

e. Solder the other brown lead of T2 to pin 8 of X10.

f. Leave the green leads of T2 their full length and solder one to pin 1 of the 4D32 socket X7, the other to pin 7.

g. Solder one of the blue leads of T2 to pin 1 of the 6AL5 socket X11.

h. Solder the other blue lead of T2 to pin 5 of X11.

i. Solder one of the yellow wires of T2 to pin 8 of the 5R4 socket X8.

j. Solder the other yellow wire of T2 to pin 2 of X8.

k. For the sake of neatness lace these transformer leads to the main wiring harness from T2 to the 5R4 sockets X8, X9 leaving the black wires and the red-yellow wire out of the cable opposite terminal board X17 and the green wires out opposite pin 1 of socket X7.

l. Solder the red-yellow lead of T2 to the ground lug under the mounting nut of X17 nearest the top of the chassis.

m. Connect one of the black leads of T2 to the center terminal of terminal

board X17. Do not solder.

n. Connect the other black lead of T2 to the top lug of X17 to which a blue-Orange lead was previously connected, solder.

o. Install a grommet 22-311-1 in the hole beside the terminal board X17, insert the power cord leads, tie an overhand knot in the cord inside the chassis and solder the leads, one to the center terminal of X17, the other to the body terminal of the fuse post.

40. a. Install a #10 solder terminal under the mounting nut of the choke L1 nearest the center of the chassis.

b. Connect the lead previously soldered to pin 3 of socket X11 to this lug. Do not solder.

c. Solder a piece of W2 wire between pin 7 of VFO socket X12 and pin 4 of 6AL5 socket X11.

d. Connect one of the leads of choke L3 to pins 2 and 7 both of socket X11. Solder at pin 2 only.

e. Fasten a #10 soldering lug under the front mounting nut of the variable inductor L9 and solder the black wire which comes out of the harness very close to this point.

41. a. Solder shunt SH2 between the front terminal and the second terminal from the front on terminal board X22, as seen in Figure 10.

b. Solder shunt SH1 between the second and third terminals from the front of terminal board X22.

42. a. Trim the RG8U lead G1 to exactly 11 inches long. Strip the insulation off the outside of one end for one inch. Trim 1-1/4" of insulation off the other end, unbraid the shield on this end.

b. Cut the center insulation back to 1/4" of the point where the outside insulation was cut on the 1-1/4" length.

c. Fasten a #10 solder terminal under the rear bottom stator connection on the output coupling condenser C30.

d. Fasten another #10 soldering terminal under the screw on C30 under which was previously fastened a soldering lug for connecting together the rotors of C30 and C29.

e. Trim the center conductor to the RG8U to length, fit it in the lug on C30's stator and solder.

f. Divide the strands of the outer braid, gather about half on the proper side of the cable, twist them together into a lead and solder to the solder terminal on the rotor of C30. Trim off the other strands of the braid which are left.

43. a. At the other end of the RG8U cable, slide the braid back on the cable, trim the insulation of the center conductor back about 1-1/4", tin the end of the wire.

b. Slide the hood H1 (83-1H Amphenol) onto the RG8U cable.

c. Force the receptacle J4 (83-1R) into the hole on the rear edge of the chassis under L1 from inside the chassis, the solder terminal extending into the chassis.

d. Fill the solder terminal with solder.

e. Pushing the hood back out of the way, solder the center conductor of the RG8U to the solder terminal of J4.

f. Fasten the receptacle and hood to the chassis using 3/16" 4-40 screws, shakeproof washers and nuts.

g. Slip the braid of the RG8U down over the hood, solder carefully and trim off the excess braid. Be sure to check and make sure that none of the braid wires are left inside the hood.

44. a. Mount the audio gain control R6 (1/2 meg. volume control) on the front

edge of the chassis under the meter switch. Discard any washers furnished with the control.

b. Using W2 wire solder the center lug of R6 to the #1 pin of the 6AU6 socket X2.

c. Looking at the back of R6, the lug in a counter-clockwise direction from the center lug should be connected to pin 2 of X2 with W2 wire. Solder at control only.

d. Solder R7, 220 ohms, 1/2 watt to pin 2 of X2, connect other end of R7 to pin 7. Do not solder.

e. Connect C1, 10 mfd. 25 V tubular electrolytic between pin 7 of socket X1 and the rear terminal of X19 and solder at X19.

f. Connect C4 .1 mfd. tubular condenser between the end terminals of terminal board X19. Do not solder.

g. Solder the ground lead at the rear nut of terminal board X19.

h. Connect R5, 25,000 ohms, 1/2 watt resistor between the center terminal of terminal board X19 and the front terminal. Do not solder.

i. Connect R4, 250,000 ohms, 1 watt between the front terminal of X19 and pin 5 of socket X1. Do no solder.

j. Connect R3, 470,000 ohms, 1/2 watt between the front terminal of X19 and pin 6 of socket X1. Solder at X19 only.

k. Connect R8, 50,000 ohms, 1/2 or 1 watt resistor between pin 6 of socket X2 and the center terminal of terminal board X19. Do not solder.

l. Connect the modulator screen by-pass condenser C8, .5 mfd. 600 volts between pin 5 of socket X3 and pin 2 of socket X4 and solder. C8

should lie parallel to the rear of the chassis and behind sockets X3 and X4, instead of the position shown in figures 8 and 10.

m. Solder C3, .02 mfd. 600 V tubular to pin 6 of socket X1. Connect the other end to the rear terminal on X19. Do not solder.

n. Connect C6, .02 mfd. 600 V tubular between pin 6 of socket X2 and the rear terminal of X19. Solder at pin 6 only.

o. Solder R2, 2,000 ohms, 1/2 watt between pins 4 and 7 of socket X1.

p. Looking at the rear of the volume control R6 solder to the first terminal clockwise from the center terminal C2, .003 mfd. 600 V tubular condenser. Solder the other lead of C2 to pin 5 of Socket X1.

q. Solder one end of C5, .01 mfd. 1000 volts moulded or paper tubular condenser to pin 7 of socket X2. Connect the other end to the right hand terminal of board X18. Do not solder.

r. Solder R9, 1 watt 250k ohm resistor between the right hand terminal of X18 and the X18 terminal second from the left. See Operation 35

When the Modulation transformer has been wired for 500 ohm output, R9 should be changed to 120k ohm 1 watt. It is connected between the right hand and center terminals of X18, not as described previously.

Check to make sure all the joints are soldered in the audio section.

45. a. Mount the bias supply filter condenser C12 and C13 (dual, 16 mfd. 150 volt electrolytic) parallel to the rear edge of the chassis between socket X11 and resistor R13 with the red and green leads to the left.

b. Connect the positive leads of C12 and C13, red and green, to the ground lug near one end of the condensers. See Figure 8.

c. Connect one of the negative leads (blue) of this dual condenser to pin 7 of socket X11 and solder.

d. Solder both the white lead 21A, the other negative lead of the dual condenser (black) and the remaining lead of the choke L3 to pin 6 of socket X11.

46. a. Mount the dual capacitor C10-C11 (dual 16 mfd. 450 volts) parallel to the rear edge of the chassis on the screw located beneath the choke L1, the negative (black) lead toward terminal board X22.

b. Solder the negative (black) lead to the solder lug located under the rear mounting nut of terminal board X22.

c. Mount choke L2 (SNC P1501) on the rear edge of the chassis with the leads down, directly under L1 using 3/8" 8-32 screws, shakeproof washers and nuts.

d. Solder one of the positive leads of C10-C11 and one of the leads of choke L2 to pin 3 of socket X10.

e. Solder the other lead of L2 and the other positive lead of C10-C11 to pin 8 of socket X10.

47. a. Mount the audio transformer T3 (SNC P1503) underneath the chassis on the left end above the terminal board X18, with the red and blue leads up. Use 1/4" 6-32 binding head screws, shakeproof washers and nuts.

b. Solder the yellow lead of T3 to pin 3 of socket X3.

c. Solder the green wire of T3 to pin 3 of socket X4.

d. Solder the black lead of T3 to the 4th terminal from the left end of terminal board X18.

e. Solder the red lead of T3 to the center terminal of terminal board X19.

f. Solder the blue lead of T3 to the plate pin 5 of socket X2.

48. a. Mount the high voltage filter condenser C9, 10 mfd. oil-filled on the rear edge of the chassis between the left end of the chassis and the Amphenol output socket. Use 3/4" 8-32 screws, shakeproof washers and nuts. Mount the brackets so that there is as much clearance as possible between the condenser and the wiring below. The screw nearest the receptacle J3 should have the nut outside the chassis so it can be

used for a ground terminal.

b. Using W2 wire, solder a lead from one terminal of C9 to the #1 pin of socket X9.

c. Also using W2 wire, solder a lead between the other terminal of C9 and the second terminal from the front of terminal board X22.

49. Solder plate caps TC2 and TC3, one on each of the modulation transformer leads previously run thru a grommet to the top of the chassis.

50. a. Using the shielded wire, W5, temporarily connect the microphone input connector J1 (PC1M Amphenol).

b. Solder the center conductor to the center contact of J1, wrap a short piece of W2 wire, stripped, around the shielding of the wire W5 and solder. Solder the other end of the wire to the ground lug on the connector. Cut 1" off the other end of W5 for use in 50 d.

c. Wrap another short piece of stripped W2 wire around the shield braid of the other end of the shielded wire and connect to pin 2 of socket X1.

d. Slip a half-inch piece of spaghetti over one lead of the resistor R1 1 meg. 1/2 watt. Slip a one inch length of shield braid only over the entire resistor for shielding. Tin the ends of the braid at the end of the resistor where it is insulated with spaghetti. Solder the braid to the other lead of the resistor.

e. Solder the center conductor of the shielded wire and the insulated end of the resistor R1, 1 meg. 1/2 watt to pin 1 of socket X1.

f. Solder the other end of R1 to pin 2 of socket X1.

g. Secure a #10 solder lug under the most convenient nut on the chassis near pin 4 of the 4D32 socket X7 and solder X7's #14 ground lead to this lug.

51. a. We are now at the stage where the testing should be done. The panel should not be mounted nor the transmitter placed in the cabinet until after testing thouroughly. First look over the wiring carefully for

unsoldered joints, accidental grounds and other mechanical difficulties.

b. Loosen the tap on the high voltage divider R13 and adjust the position to approximately 1/3 of the distance from the end nearest the center of the chassis.

c. Next with all the tubes out of their sockets, plug in the power cord, throw the low voltage switch and check to determine that line voltage is applied to the primary (black) leads of the low voltage transformer T2.

d. If no trouble is encountered at this stage, throw the high voltage switch and check to see if line voltage is applied to the high voltage transformer T1.

e. Next plug in the 5Z4 rectifier in socket X10 and check the voltage between ground and the fourth terminal from the front of the chassis on terminal board X20. This voltage should be approximately 380 volts positive with reference to ground, with the line voltage approximately 120 volts.

f. Plug the 6AL5 in the socket X11. This should produce a voltage approximately 85 volts negative with respect to the chassis on the front terminal of terminal board X21. Voltage at the second terminal from the front of the terminal board X21 should be approximately 28 volts. Voltage at the third terminal from the front should be around 43 volts. These readings taken with a 20,000 ohms per volt meter will be less on a 1,000 ohm per volt meter. Connect the meter temporarily to its panel leads.

g. Set the phone/CW switch on CW. Next plug in the 6AU6 oscillator tube into socket X6 and switch the meter to the "osc" position. Oscillator

current without a crystal will run approximately 14 ma. With an active 160, 80 or 40 meter crystal plugged into the crystal socket this current will drop to around 7 ma. The meter reads 25 ma. full scale on the oscillator position.

h. Next plug the 6AQ5 buffer into socket X5, set the bandswitch to correspond with the output frequency desired. Turn the excitation control R25 up about half way. With the meter switch in the "buffer" position, tune the oscillator condenser C18 to the position where the 6AQ5 ("buffer") plate current rises. Tune C18 for maximum "buffer" plate current. This rise in plate current indicates that the 6AQ5 is receiving excitation.

i. Do not yet apply high voltage. Next plug in the 4D32 amplifier and connect the plate cap.

j. Turn the meter switch to the "grid" position. The meter may now show some deflection indicating grid current flowing in the 4D32. The meter reads 25 ma. at full scale in the "grid" position and the maximum permissable grid current on the 4D32 is 15 ma. or 60% of full scale. Avoid exceeding this value. The amount of excitation which can be obtained will vary over the various bands, however enough excitation to drive the amplifier to full output over its entire range can be obtained even though the maximum of 15 ma. is not necessarily available. Although the loading of the final amplifier will cause the grid current to decrease, in general the following is the amount of excitation available under different operating conditions. with reasonably active crystals.

Xtal Freq.	Output Freq.	Grid Current
1800-2000	1800-2000	15 ma. plus

	Xtal Freq.	Output Freq.	Grid Current
	1800-2000	3600-4000	15 ma. plus
	1800-1825	7000-7300	13 ma. - note 1
	1750-1800	14000-14400	13 ma. - note 2
	3500-4000	3500-4000	15 ma. plus
	3500-3650	7000-7300	15 ma. plus
	3500-3600	14000-14400	15 ma. - note 3
	3500-3712.5	28000-29700	8 ma. - note 4
	7000-7300	7000-7300	15 ma. plus
	7000-7200	14000-14400	15 plus
	7000-7425	28000-29700	15 plus
	7000-	21000	15 plus
(14 mc. xtals)	4666-4800	14000-14400	15.
	4866-4950	28000-29700	10

Note 1: This type operation is not recommended as it is possible to obtain output also from 5400 kcs. to 5475 kcs.

Note 2: It is possible to accidentally get output around 10.8 mcs and 11.6 mcs.

Note 3: It is possible to get output around 10.8 mcs.

Note 4: It is possible to get output around 24.5 mcs.

k. Re-tune the oscillator and buffer tuning condensers for maximum 4D32 grid current keeping this value to 15 ma. or below by turning the excitation control back.

l. Next plug the 5R4 rectifiers into sockets X8 and X9 and with the excitation control turned to zero, throw the high voltage switch on. The voltage from the lug of the voltage divider nearest to the center of the chassis should be approximately 700 volts positive above the

chassis. Keep the 807 plate caps away from ground. Don't touch them! They have full plate voltage on them.

m. Turn the excitation control up until the 4D32 draws about 150 ma. plate current (read on the "plt" position of the meter switch).

n. Tune the final amplifier to resonance starting with the tuning condenser C29 at maximum capacity. This precludes the possibility of tuning the final amplifier to a harmonic. Resonance is the point where the current dips sharply.

o. Attach the antenna to the output terminal and re-turn the amplifier to resonance. Minimum coupling is with C30 turned counterclockwise to full capacity and the coarse coupling switch set counterclockwise with all the capacitors in the circuit. The amplifier should be tuned to resonance with minimum coupling and then loaded by adjusting the coarse coupling switch and C30 bringing the amplifier back to resonance each time with C29. The antenna should be loaded until the final amplifier plate current dips only about 10% as the amplifier is tuned thru resonance. The grid current should now be brought up to its normal value (10 to 12 ma.) and the plate current will be around 275-300 ma. Turn off the high voltage! Antennas requiring balanced transmission line currents M2X may be loaded by means of an external balanced tank circuit link coupled to the transmitter.

p. Next plug in the 6AU6 amplifier tubes into sockets X1 and X2. Plug the 807's into the socket X3 and X4 and attach the plate caps.

q. With the audio gain control turned to the off position and the phone/CW switch in the phone position, throw the high voltage on. If a whistle

is heard from the modulation transformer, turn the high voltage off and reverse the 807 plate caps.

r. The tap on the voltage divider R13 should now be adjusted in the "phone" position with the final drawing normal plate current the voltage at the tap is between 310 and 350 volts. Adjust the tap so that the no signal modulator plate current reads between 70 and 80 ma. Don't try and adjust the tap with the plate voltage on! Loosen the tap sufficiently so that the resistance wire is not damaged as the tap is moved.

s. Attach your microphone to the mike input connector and adjust the audio gain control for 100% modulation.

52. a. While the transmitter is still out of its cabinet and the front panel is still unattached, it is a good plan to check the operation of the transmitter on all bands to be certain oscillator and buffer stages are wired correctly.

53. After thoroughly testing the transmitter, mount the panel on the chassis as follows:

a. Unsolder the microphone connector J1 at the connector.

b. Mount the meter M1 in the panel using the screws and washers furnished with it.

c. Mount the final tuning index plate and escutcheon assembly D2 (23.906-1). The maroon escutcheon goes over the rectangular hole in the center of the panel, the index plate behind the panel with the indicating mark up. The spacers should be between the panel and the plate. Mount with the screws, washers and nuts furnished.

d. Mount the microphone connector on the panel with the smooth washer between the connector and the front of the panel. Discard the insulating washers. Secure to the panel with the nut furnished on J1.

e. Solder two of the flat #10 solder lugs, one to each of the meter leads.

f. Mount the jewels X13B and X14B in their proper places on the panel, with the green jewel toward the left of the panel, and secure with the nuts furnished.

f_1 Mount a panel bearing D17 on the front panel in the hole corresponding to the drive shaft of the final amplifier tuning dial. The threaded portion of the panel bearing should be toward the chassis.

g. Slip the final tuning dial D1 (23.906-1) on the shaft of the condenser C29, the hub toward the rear of the transmitter. D1 should be as far back as possible and it is not yet necessary to tighten it.

h. Check the front of the chassis to make sure that all the bearings required are properly installed and that all shafts and shaft couplers are in their correct positions and tight.

i. Tentatively place the panel over the shafts of the transmitter, shifting shafts as necessary to get them to pass thru the panel holes.

j. Note which, if any, of the panel bearings or mounted bushings of switches or other components keep the panel from slipping down over the threads. If necessary, loosen the nuts which are causing the trouble and shift the positions of the components slightly.

k. Make a very careful check to see that all the jobs which cannot be done after the panel is in place are taken care of. Put the panel in position and fasten by means of the 3/32" thick 3/8 x 32 nuts with the exception of the toggle switches. Be most careful not to mar the panel with pliers.

l. Fasten the knurled nuts on the toggle switches with your fingers. By grasping the knurled nut of the switch and at the same time the body of the switch and moving both the nut and switch slightly, the nut may be tighten without tools.

m. Mount the ground lug on J1 using one of the 3/8" - 32 nuts. Don't tighten this nut excessively since the threads will strip easily at this point.

n. Re-solder the input leads to J1.

o. Connect the meter leads by means of the nuts on the meter terminal studs being careful to observe correct polarity.

p. Set the main dial to zero with the condenser C29 at full capacity and tighten.

q. Attach the knobs to the shafts per the following. If, as the knobs are secured, they are tightened as tightly as possible, loosened and re-tightened they will be anchored solidly and will not turn on the shaft.

Oscillator - 0-100 over 180 degrees zero on dial at full capacity of condenser.
Bandswitch - With switch at extreme counter-clockwise position dial reads "160".
Drive - With excitation control at extreme counter-clockwise position dial set at zero.
Main Tuning - Spinner dial no orientation required.

Coarse Coupling - Dial marked 1 to 7, dial on position 1 with switch in counter-clockwise position.
Fine Coupling - Dial 0-100 at zero position with full capacity.

Meter - With meter switch in counter-clockwise position, dial reads "Off".
Oscillator - 0-10 dial at zero with switch in counter-clockwise position.
CW - Phone - Dial has single mark at CW position with switch at counter-clockwise position.
160-Out-In - Dial has single mark at "Out" position with switch at counter-clockwise position.
Audio - With control at counter-clockwise position 0-10 dial at "0" position.

r. Slide the transmitter into the cabinet being careful to support the chassis at the rear to avoid scratching the bottom of the cabinet. Lift the front panel slightly to keep it from marring the front bottom edge of the cabinet. Secure the chassis by means of the 3/8" self-tapping screws run through the bottom of the cabinet.

s. Secure the panel to the cabinet using cup washers and oval head 10-32 screws.

TUNING INSTRUCTIONS

General: In initially tuning the transmitter you will find the tuning curves (last two pages of the book) useful in determining the mode of operation of the exciter. For instance, on 160 meters (1.8 - 2.0 mcs.), 80 meters (3.5 mcs. - 4.0 mcs.), 40 meters (7.0-7.3 mcs.) the plate circuit of the oscillator and the plate circuit of the buffer are both tuned to the output frequency. This is true in all cases no matter whether the crystal is ground to 160, 80 or 40 meters or with VFO excitation. When delivering 20 meter output (14.0 - 14.4 mcs.) the 6AQ5 buffer is tuned to the output frequency but the plate circuit of the oscillator is tuned to some lower frequency. If 40 meter crystals within the range of 7.0 - 7.2 mcs. are used for 20 meter output the oscillator plate circuit is also tuned to the range of from 7.0 to 7.2 mcs. The same thing is true when using crystals within the range of 3.5 - 3.6 mcs. (80 meters). While 160 meter crystals of the correct frequency (1.75 - 1.8 mcs.) will drive the transmitter satisfactorily on the 20 meter band, their use is not recommended. It is possible to accidentally obtain output of 10.5 - 10.8 mcs. and 12.25 - 12.6 mcs. Third harmonic 20 meter crystals whose fundamental frequencies lie between 4.6 and 4.8 mcs. may also be used for 20 meter output. With these crystals the plate circuit of the oscillator is tuned to the crystal's fundamental frequency. On 10 meters (28.0 - 30 mcs.) the 6AQ5 buffer is also tuned to the output frequency and the oscillator plate circuit is tuned to half this frequency. This will permit use of both 40 meter and 20 meter crystals for 10 meter output. Theoretically it would be possible to use 10 meter crystals and 80 meter crystals for 10 meter output but in practice is not satisfactory. Ten meter crystals do not produce enough drive and with 80 meter crystals (3.5 - 3.77 mcs.) there is the possibility of obtaining output from 21.0 - 22.62 mcs., from 24.5 - 26.39 mcs. and at 31.5 mcs.

Tuning should be done in the CW position. Oscillator and buffer stages have plate voltage and may be tuned without having the 4D32 supply switched on. The excitation control (labelled "drive") provides a convenient means of limiting drive to the 4D32 grid. Since the final amplifier is supplied with cutoff bias, amplifier plate current can be set at any desired value by adjusting grid current. Both excessive grid current and excessive "out of resonance" plate current can be avoided thus prolonging tube life. Maximum grid current to the 4D32 is 15 ma. If grid current is kept at 10 ma. there is no appreciable difference in efficiency and considerably less effect from contamination of the grid by cathode material.

There is some variation in characteristics among 4D32's and the optional resistor R24 shown in dashed lines on the schematic in the grid circuit of the 4D32 is to compensate for this variation. Grid bias of the 4D32 with key down, normal drive and normal loading should run between 90 and 110 volts. If the bias is more than this, install R24.

The maximum permissable loaded plate current for the 4D32 tube is 300 ma. For most efficient performance and long tube life, 4D32 plate current should be kept between 250 and 275 ma.

160 METERS (1809 KC FREQ) drive — 4
FINAL — 0
FINE COUPLING — 80
ANTENNA CONDENSER — 160
AUDIO — 4
NOTE — if final current not OK adjust FINE COUPLING

Detailed Tuning: Assume that the Viking I transmitter is to be tuned up for output in the 40 meter band (7.0 - 7.3 mcs.) using a crystal within the same range. The chassis should be connected to an effective ground, the antenna connected to the output terminal located near the center of the rear of the chassis. Place all the tubes in their respective sockets and connect the plate caps to the 807's and the 4D32. Install the crystal in position #1 of socket X15.

Set the exciter bandswitch (marked "band") to the "40" position. Turn the "drive control counterclockwise to ~~zero~~ 3. Set the main tuning dial to zero. ~~Turn the coarse coupling control (marked "coupling") to position #1.~~ Turn "fine coupling" control to ~~zero~~ 120 (C30 at full capacity). ~~Meter switch should be on "exc". Crystal switch should be turned counterclockwise to zero position.~~ Buffer tuning control may be in any position. "CW-Phone" switch should be in "CW" position and "160" meter switch should be in the "Out" position. Audio gain control may be in any position.

NOTE

a. Throw SW1 "on". This applies all voltages except plate and screen voltages for the 4D32 and the 807 modulators. ~~Oscillator plate current should now rise to about 13 ma.~~

b. Switch crystal switch to ~~position #1.~~ desired XTAL ~~Oscillator plate current should drop precentibly.~~

c. Switch meter to "buffer" position and advance the "drive" control about 3. ~~1/3 of the way in the clockwise position.~~

d. Rotate the "oscillator" tuning dial slowly until the buffer plate current rises. Adjust the oscillator tuning for maximum buffer plate current.

e. Switch meter to "grid" position and note the grid current. If it should be over 15 ma. reduce it at once by turning the "drive" control in a counter clockwise direction. There probably will be no grid current at this point and if there were it would be because the buffer tuning condenser happened to be at resonance.

f. Tune the buffer condenser for maximum grid current keeping it at 15 ma. or less by means of the drive control. Leave buffer in resonance and reduce grid current to zero by means of the "drive" control.

g. Switch meter to "plt" position and switch ~~SW2~~ MIC. SW. on. Turn "drive" control clockwise until plate current rises to 150 ma.

h. Tune final dial toward 100 until the plate current dips sharply. Be certain that the final is tuned to the <u>first</u> dip in plate current thus assuring that the amplifier is tuned to the fundamental and not to a harmonic.

i. Switch meter back to "grid" position, touch up oscillator and buffer tuning for maximum grid current. Advance "drive" control until grid current is 10 ma. Switch meter back to "plt" position.

j. Proceed to load the antenna by switching coarse coupling switch to position #2 and retune main dial for minimum plate current. If there is not sufficient coupling change coarse coupling switch to position #3 and again retune main dial for minimum plate current. This should be continued until the amplifier current is around 200 ma.

k. Turn the fine coupling control toward 100 until amplifier plate current rises to about 250 ma. Retune main dial for minimum plate current. Follow this procedure until the desired plate current between 250 and 275 ma. has been reached. If after setting the fine coupling control and the desired degree of coupling is not attained, reset fine coupling to zero and tune once again for minimum plate current with the main dial. It will now be necessary to set the coarse coupling switch to the next position toward #7 and retune amplifier as in step j. Now it will be possible to obtain the desired loading with the fine coupling control.

l. For CW operation now simply plug in the key. Check to be sure that amplifier plate current is zero with the key up.

160 Meter Tuning: The crystal should be within the range of 1.8 to 2.0 mcs. Tuning is exactly the same as in the foregoing detailed instructions except that bandswitch (marked "band") should be in the "160" position and the switch marked "In 160 Out" should be turned clockwise to the "In" position. You will find that the oscillator and buffer tuning is quite broad on this band and due to the design of the oscillator there may appear to be more than one oscillator resonance point. This is not a defect and will not affect operation. Oscillator and buffer condensers will be tuned to nearly full capacity at 1.8 mcs. You will find in tuning the main dial that the amplifier resonant point will be quite close to zero on the dial and as you couple the antenna as in steps j. and k. above, the final dial may actually tune to zero and the antenna not yet sufficiently coupled. In this case, leave the main dial tuned to zero and complete amplifier loading by adjustment of the coarse coupling switch and the fine coupling control only. Although you may feel that the amplifier is operating out of resonance, actually the circuit is quite broad on this band and your efficiency will be very nearly as good as on other bands.

80 Meter Tuning: Crystals should be within the range of 1.75-2.0 mcs., 3.5 - 4.0 mcs. Exciter bandswitch should be on the "80" position, the amplifier 160 meter switch (marked "Out 160 In") should be in the counterclockwise position (Out). The detailed instructions above apply. At frequencies near 3.5 mcs. amplifier tuning may prove to be the same as the 160 tuning, when attempting to load very high impedance antennas.

40 Meter Tuning: Use crystals within the following ranges of Frequencies: 1.75 - 1.825 mcs., 3.5 - 3.65 mcs., 7.0 - 7.3 mcs. OR VFO Follow the detailed tuning instructions outlined before.

20 Meter Tuning: Use crystals within the following ranges: 3.5 - 3.6 mcs., 7.0 - 7.2 mcs., 14.0 - 14.4 mcs., (fundamentals 4:67 - 4.8 mcs.). Tuning same as detailed instructions.

15 Meter Tuning: Use crystals within the following ranges of frequencies: 3.5 - 3.575 mcs., 7.0 - 7.15 mcs. Tuning is the same as for other bands. The coarse coupling switch will be set at #7 with all the mica coupling capacitors out of the circuit.

10 Meter Tuning: Use crystals within the following ranges: 7.0 - 7.425 mcs., 6.74 - 6.8 mcs. (11 meters), ~~14.0 - 14.85 mcs., 13.48 - 13.61 mcs. (11 meters).~~ Tuning is the same as for other bands. The coarse coupling switch will be set at position #7. Should you have difficulty in obtaining an indication of grid current when tuning the buffer on 10 meters, switch the high voltage on, set the meter on "plt" and tune the buffer for an indication of amplifier plate current. You will find that this method is very sensitive. After tuning the buffer for maximum amplifier plate current, "touch up" the oscillator tuning. Don't permit the 4D32 to run for any length of time with excessive plate current. As soon as you have sufficient excitation to produce 150 ma. or so plate current, tune the amplifier to resonance (minimum plate current). At 30 mcs. the final dial will be set at or very close to 100. At this frequency the tuning capacity is effectively fixed and tuning is accomplished by varying the inductor which has approximately 1-1/2 turns left in the circuit.

Phone Operation: Tune up the transmitter in the CW position. Turn off the high voltage SW-2. Turn "audio" control counterclockwise to zero. Switch "Phone-CW" to phone position. Switch SW-2 on but if a squeal is heard from the transmitter turn it off immediately. A squeal is indication that the 807 plate leads to the caps should be reversed. Be sure the high voltage is off before doing so! Connect a high impedance crystal or high output dynamic microphone to the connector marked "mic". Switch meter to "mod." position and switch SW-2 on. Talking into microphone advance audio control clockwise until plate current of 807s rises to about 175 ma. on peaks. Antenna current should advance about 20% on modulation.

VFO Operation: A mica insulating capacitor of 50 or 100 mmf. capacity should be installed between the "hot" VFO RF lead and the center contact of the VFO input receptacle. If this is not done, in most cases the grid bias of the 6AU6 tube will be short circuited. The amount of drive required by the Viking from a VFO is very slight. Provided the oscillator is stable enough it need have output on two bands only namely 160 meters and 40 meters. With the VFO operating on 160 only 2 volts of RF are required to drive the transmitter to full output on 160 and 80 meters. Six volts of 40 meter VFO output is sufficient to drive the transmitter to full output on 40, 20, 15 and 10 meters. As with crystal controlled operation the VFO's output frequency may be the transmitter's output frequency, 1/2 or 1/4 the transmitter's output frequency. It should be borne in mind that any tendency of the VFO to chirp or drift is increased when the transmitter's output frequency is twice or four times that of the VFO.

Note: The components C7, R11 and R10 shown across the secondary of the driver transformer in the schematic, are optional. Depending upon the type of microphone used and the individual's preference, these parts may be used to still further suppress the high audio frequencies.

Due to variations in line voltage and tolerance of components, bias values may turn out to be different than those shown on figure 12. Values of R15, R16 and R17 may be changed as necessary so long as the current limit of 18 ma. for the 6AL5 is not exceeded.

VIKING I TRANSMITTER

Changes required for use of 829B final amplifier.

1. Turn coupling capacitor C31 down toward chassis to keep plate leads short.

2. Connect another parasitic choke (L11) to C31 by means of a solder terminal.

3. Connect a plate terminal (Johnson 119-848) to each of the parasitic chokes L11.

4. Leave pins 4 and 5 of socket X7 grounded to the chassis but remove the ground lead from pin 7.

5. Remove filament wire from pin 7 and connect filament lead to chassis by means of a solder terminal under a convenient screw.

6. Connect pins 1 and 7 together with #20 wire.

7. Remove the ground lead of the filament bypass condenser C40 and re-connect to ground on the socket mounting screw near pin 1.

8. Remove C28 lead together with screen grid lead from pin 2 and connect to pin 3.

9. Either change screen dropping resistor R28 to 12,500 ohms 20 watts or connect a 3,000 ohm 10 watt resistor in series with R28.

10. Remove condenser C25 and choke L6 from pin 6.

11. Connect a jumper of #14 wire between pins 2 and 6 allowing it to bow upwards 1/2".

12. Re-connect C25 and L6 to the center of the jumper to provide balanced drive to the grids.

Adjustment: With the final amplifier loaded to approximately 230 ma. the voltage divider tap should be adjusted so that screen voltage is approximately 225 volts. This screen voltage setting should provide about 80 ma. no audio signal cathode current on the 807 modulators in the phone position with final amplifier current of 230 ma.

Bias Voltages: Adjustment of bias voltages can be accomplished by changing values of R15, R16, R17 and R25, keeping total current below the 18 ma. limit of the 6AL5.

Viking I Transmitter

Typical operation using 829B final
within ICAS tube ratings.

CW operation with 115 V 60 cycle ac input.

FREQUENCY 28 mc.

P. A. CATHODE CURRENT 230 ma.

SCREEN GRID VOLTAGE 225 volts (loaded)

P. A. PLATE VOLTAGE 660 volts (loaded)

P. A. GRID CURRENT 12 ma.

P. A. GRID BIAS -97 volts

POWER OUTPUT 95 watts

Phone operation with 115 V 60 cycle ac input

FREQUENCY 28 mc.

P. A. CATHODE CURRENT 230 ma.

*SCREEN GRID VOLTAGE 225 volts (loaded)

P. A. PLATE VOLTAGE 620 volts (loaded)

P. A. GRID CURRENT 12 ma.

P. A. BIAS VOLTAGE -97 volts

POWER OUTPUT 87 watts

MODULATOR CATHODE CURRENT 80 ma. (no signal)

*13,000 ohm screen dropping resistor used.

Viking I Pi-Network Tuning and Harmonic Suppression

The pi tuning/coupling network in the Viking I is designed to load the final amplifier into antenna resistances of nominally 50 to 600 ohms throughout its frequency range. In addition it is capable of "tuning out" series antenna reactances up to several hundred ohms to complete a good match to most unbalanced antenna systems. The range of antenna impedances which may be matched by the pi network at frequencies higher than 7.0 mcs. extend from roughly 25 to 2000 ohms.

When the transmitter is well grounded and properly tuned, the harmonic suppression is excellent, generally much better than other conventional methods of antenna coupling. This should be of interest to amateurs afflicted with TVI or other high frequency interference problems.

A. Importance of grounding:

To obtain proper tuning, coupling and harmonic suppression with any transmitter antenna coupling system, the part of the circuit designed to operate at RF ground potential must be at RF ground potential. A "room full of RF" is evidence that a high RF potential exists on something in or near the room. In many cases the source of RF is the transmitter's chassis and power cord. The power cord is very closely coupled to the chassis by the electrostatic shields of the power transformers. This condition is very undesirable for several reasons. Three objectional factors which obviously affect the loading of the transmitter when poor grounds are involved are:

1. The impedance that the output terminal of the transmitter looks into includes not only the true antenna to ground impedance as presented by the antenna feedline but also the transmitter chassis to ground impedance. This additional impedance in some cases will raise the apparent antenna impedance to such a high value that it cannot be loaded by the pi network.

2. Part of the transmitter's power is lost in the ground system due to radiation of the ground lead, power cord or cabinet. This power is quickly dissipated in surrounding objects and contributes nothing to effective radiated power except to distort the antenna's normal field pattern.

3. It is conventional, in designing a transmitter, to bypass harmonics or any possible sources of stray high frequency currents to the chassis on the assumption the chassis will be kept as near ground potential as possible. When a high impedance is presented to these currents at the chassis they are able to radiate to some extent rather than be passed harmlessly to ground.

B. How to obtain a good ground:

What may appear to be a good ground at one frequency may prove to be a poor ground at another. A single ground lead may have "standing waves" on it due to its length. While it may seem difficult to obtain a good ground over

a wide range of frequencies, it can be done and will be well-worth the trouble when increased radiation efficiency, ease of antenna loading and reduced TVI and BCI are considered. There is also reduced danger of damaging microphones, receivers and other associated equipment with excessive RF fields.

Avoid using the "cold" side of the power line, power line conduit or gas lines for RF grounding. Your good relationship with neighbors and the safety of your family may be jeopardized by RF in the wrong places. Some suggestions which may help to obtain a good ground are:

1. Water pipes or metal building structural members are usually good sources of earth grounds.

2. Use heavy conductors (#14 or larger) between the connection at the ground point and the transmitter. Copper ribbon is excellent for this purpose.

3. The use of several ground leads, each of a different length and selected at random may be helpful in keeping grounding impedance low at the transmitter, even though the transmitter is some distance from a true earth ground. The possibility of obtaining an effective ground at any frequency throughout the transmitter's range is quite good. If at any one frequency, one of the ground leads presents a low impedance at the chassis the chassis is effectively grounded. By changing the length of one of the ground leads experimentally, a good ground can often be obtained at a frequency which has been troublesome. In bringing several leads to the transmitter, small closed loops near the transmitter or antenna feed line should be avoided. Induction fields will tend to raise the impedance of the ground leads.

4. In cases where it is impossible to obtain a good earth ground, connecting the transmitter chassis to some system of conductors having a very low effective impedance to ground compared to the antenna impedance may be helpful. Usually this artificial "ground" takes the form of a system of radial wires spread horizontally on the floor, a gridwork of wires, or a large metal sheet on the floor below the transmitter. To be effective, the minimum area covered by the metal conductors should be roughly equivalent to a square, the length of one side of which approaches a quarter wavelength. This system of "grounding" should be experimented with before committing the location to any permanent installation.

5. A simple counterpoise made up of a single wire attached to the chassis may be helpful. On 10 meters a length of 6 to 8 feet may be attached and the open end cut off 4 inches at a time until the chassis becomes "colder". The open wire may be allowed to drop along the floor although its open end will be somewhat "hot".

6. A rough check on the effectiveness of the transmitter gound may be made by touching the chassis while watching the PA cathode current and grid current with the transmitter operating into its antenna. A change in current upon touching the chassis is indicative of an ineffective ground. If a neon bulb, held between the fingers, can be ignited by touching a contact to the chassis,

the RF present is excessive and is another indication of an ineffective ground. In cases where the transmitter is feeding a low impedance antenna, the test by touching the chassis is more reliable since 50 to 60 volts is required to ignite the neon lamp.

C. Loading Random Antennas with the Pi Network:

With the transmitter chassis well grounded, correctly designed antenna systems having relatively "flat" unbalanced feeder systems, can easily be loaded by following the instructions already given, provided the antennas' terminal impedances fall within the range of the pi network. Feeding a balanced system with a feedline over a quarter of one wavelength long, may prove to be surprisingly successful if the transmitter chassis is held at ground potential. The transmission line between the transmitter and antenna will tend to assume a partial balance at the antenna. Some standing waves will result but may not be excessive. Methods of changing from an unbalanced to balanced transmission system are discussed in the ARRL Radio Amateurs Handbook and devices for accomplishing this change over the amateur bands are beginning to be available commercially.

Antennas having random lengths, random feed points and various types of feed lines will exhibit widely different resistance and reactance characteristics. It is well to remember that the feedline is a very important part of the system. A common example of the random antenna is a horizontal wire fed by a single wire feed line. The feedline in this case actually becomes part of the radiating system. An antenna of this type can, in most instances, be fed by the pi network directly but there are critical dimensions where the antenna series reactance (inducive or capacitive) becomes too high and the antenna resistance can become either too high or too low to be matched by the pi network.

Antennas with high terminal resistance or reactance can usually be recognized while loading the final stage of the Viking I. The final amplifier is normally loaded by reducing the output coupling capacitor (C30) in small steps, retuning the amplifier to resonance each time. This results in an increase in PA cathode current and is continued until full loading is achieved. If however, a point is reached where decreasing the output coupling capacitor (C30) does not result in a marked increase in PA cathode current and the PA is not fully loaded, the antenna can be assumed to have high resistance or reactance at this frequency.

Antennas with low terminal impedance (resistance and reactance both low) can usually be recognized by a noticeable lack of coupling condenser effect in the range of settings normally used at the operating frequency. There will be little or no detuning evidenced as the coupling control is changed.

Several things can be tried in an effort to bring the antenna system into the tuning range of the pi network:

1. Change the length of the feeder line between the antenna and transmitter experimentally 1/8 to 1/4 wavelength.

2. Change the point of connection of the feedline to the antenna 1/8 to 1/4 wavelength.

3. Change the antenna length 1/8 to 1/4 wavelength. Antennas shorter than 1/8 wavelength (antenna and feeder) may be difficult to load. They present a high capacitive reactance to the transmitter output terminals. Effective antenna lengths in the vicinity of 1/2 wavelength will in general exhibit characteristics of high resistance, high reactance (inductive or capacitive) or both.

4. "Load" the antenna feeder by placing an inductor or capacitor in series to cancel out the reactance of the antenna feeder. This may require considerable cut and try and will affect only the reactive component of the antenna impedance. However, it can prove useful in some cases.

5. L type matching networks of inductance and capacitance may be used to aid impedance matching. Much discussion of this more elaborate method of bringing the antenna impedance within the range of the pi network could be included, however, the few cases where it is necessary do not justify inclusion herein. Textbook and handbook discussions will be helpful if work along this line is pursued. There is danger of resonating the coupling condenser of the pi network when using an external coil. This should be watched as excessive voltage built up across the coupling condensers can cause damage. Improper coupling or loading will take place under these conditions.

D. Dangers to be avoided and hints which may further aid in harmonic and TVI reduction.

1. When loading high impedance antennas there is a temptation to "squeeze" the last watt into the antenna by opening the coupling condensers as much as possible. Harmonic suppression is dependent, to a great extent, on the amount of coupling capacity in the circuit. It is wise to use as much coupling capacity as practical at all times. The proper amount of coupling when the antenna impedance is high, can be conveniently determined by holding a neon lamp against the antenna feeder. The coupling condenser can then be opened until little increase in glow is noticed when the coupling condenser and tuning controls are adjusted for maximum output. A decrease in coupling capacitance beyond this point may cause a higher plate current reading due to reduced plate circuit efficiency. Higher harmonic output will also result as the coupling capacity is reduced beyond the point where the output has leveled off. The random antenna system may present a more favorable impedance to harmonic output than the output on the fundamental frequency; hence it is well to use as much coupling capacity as is practical. It is well to remember that the amount of coupling capacitance needed is dependent on the operating frequency. For example, 2,000 micro microfarads at 3.5 mcs. corresponds to 160 micro microfarads at 28.0 mcs.

These are the values necessary to couple resistive loads of less than 50 ohms, at the frequencies stated.

2. The low frequency bands (80 and 160 meters) may present the danger of doubling in the final stage when the antenna impedance is high. If the coupling condensers are reduced to values comparable to the capacity of the tuning condenser (C29) the net plate tuning capacity is reduced, as these condensers are effectively in series, and it becomes very possible to inadvertently tune to the second harmonic instead of the fundamental of the intended output frequency. To avoid doubling in the final, the initial tuning should be done with all the output coupling capacity in the circuit and the final tuning control starting from its zero setting. The first dip of the amplifier cathode current as the tuning control is advanced from zero setting, is the resonant point for the fundamental output frequency. As the coupling condensers are reduced the tuning control should be reset, toward zero, for minimum cathode current so that the original plate circuit resonant frequency is maintained. Avoid reducing the coupling condenser values below the point where the output levels off as discussed previously. No danger of doubling in the final will occur if the proper tuning method is followed. For some high impedance coupling conditions on the low frequency end of the 160 meter band, much of the output coupling capacity may be out of the circuit as the antenna is loaded and the tuning control may approach the maximum tank capacity setting (dial zero) and tend to go beyond. The amplifier is quite broad on 160 meters and if, under these conditions, the tuning control is left at zero, the output coupling capacity can be reduced slightly more as more output is indicated by a neon lamp or plate current increase. Even though the amplifier seems to be out of resonance, it will still be resonant, unless the output coupling capacity has been reduced excessively, and the efficiency will be quite good.

3. If the power line voltage is low or the high voltage rectifiers have low emission, the loaded plate current may not reach the normal value. This condition should not be confused with the inability of the pi network to lead an antenna system.

Viking I Transmitter

Bill of Material

Part No. or Drawing No.	Item No.	Qty.	Description
197-111-5	CH 1	1	Cabinet
17.750	CH 2	1	Chassis
17.751-3	CH 3	1	Panel
23.900-1	BKT 1	1	Final Tuning Drive Assembly
17.754-1	BKT 2	1	Bracket - Final Cond. Mounting
17.752-1	BKT 3	1	Bracket - Final Tank Support
16.357-2	BKT 4-7	4	Bracket - Crystal Sel. and Mounting
16.1001-1	BKT 8-12	5	Bracket - Component Mounting
16.29-1	BKT 13	1	Bracket - Plate Coup. Cond. Mounting
23.906-1	D 1	1	0-100 Final Tuning Dial and Hub
23.908-1	D 2	1	Final Tuning Index and Escutcheon Plate Assembly
23.909	D 3-6	4	Drive Pulley Hub Assembly
42.49-150	D7-8	8-1/2 ft.	Dial Cord for Coupling Condenser and 160 M Switch
16.1027-1	D 9-10	2	Dial Cord Tension Springs 9/16 x 3/16 x .033 Wire
14.145-7	D 11	1	1/4" D. NPB Shaft Extension 5-1/2" long
14.145-6	D 13	1	1/4" D. NPB Shaft Extension 2-1/4" long
115-256-15	D 14	1	Shaft and Bearing Assembly 1-5/8" length
115-256-16	D 15	1	Shaft and Bearing Assembly 5-1/16" length
104-250-51	D 16	1	Insulated Coupling
13.123-7	D 17	2	Panel Bearing
104-258	D 18-19	2	Split Sleeve Coupling
23.910-2	K 1	1	Knob - Final Tuning
23.907-12	K 2-4	3	Knob Dial (100-0)
23.907-13	K 5-7	3	Knob Dial (10-0)
23.907-14	K 8-9	2	Knob Dial (Single Marker)
23.907-17	K 10	1	Knob Dial (Meter)
23.907-15	K 11	1	Knob Dial (7-1)
23.907-16	K 12	1	Knob Dial (Bandswitch)
		1	#4 Hardware Envelop
		1	#6 Hardware Envelope
		1	#8 Hardware Envelope
		1	#10 Hardware Envelope
		1	3/8" Hardware Envelope
		1	Terminal and Lug Hardware Envelope
23.08-1	Hw. 438	1	Envelope for C30 154-2 Condenser Hdw.
133-278-7	S1 S2 S5	3	1-3/4" Miniature Tube Shield
133-278-8	S6	1	2-1/4" Miniature Tube Shield
17.755	S4B	1	Oscillator Buffer Shield
17.756	S4A	1	Oscillator Buffer Shield
120-277B	X1 X2 X5 X6 X11	5	Shielded 7 Pin Miniature Socket
122-225	X3 X4	2	5 Pin Wafer Socket
122-101-8	X7	1	7 Pin Large Shielded Wafer Socket
122-228	X8 X9 X10 X12	4	Octal Wafer Socket
147-620	X13A	1	115 V Candelabra Socket

147-600	X14A	1	6 V Miniature Socket
147-310-2	X13B	1	Faceted Jewel - red
147-310-3	X14B	1	Faceted Jewel - green
126-120	X15	1	Crystal Mounting Board
22.739	X16	1	Fuse Extractor Post (for 3 AG Fuse)
22.740-5	X17-19	3	"2005" Jones Terminal Strip
22.740-6	X20-22	3	"2006" Jones Terminal Strip
71.32-170	G1	1 Ft.	RG8U Cable (cut to length)
71.32-178	G2	1¼ Ft.	RG59U Cable (Cut to length)
22.741	G3	1	Line Cord and Plug
22.113-1	G4-7	5	Rubber Grommet 9/16 OD X 5/16 ID
22.742	F1	1	5A 3AG Type Fuse
42.24-75	G13	8"	.034 ID spaghetti
26.182	W1	1	Wiring Harness
71.91-100	W2	10 Ft.	Black Plastic Covered "20 Hookup Wire
71.27-125	W3	7 Ft.	#24 Tinned Copper Wire
71.27-110	W4	4 Ft.	#14 Tinned Copper Wire
71.49-105	W5	1/2 Ft.	#20 Stranded Bare Shielded Wire
42.49-140	W6	6 Ft.	#4 Waxed Lacing Cord
119-854	TC1	1	.566 Tube Cap
119-852	TC 2-3	2	.360 Tube Cap
22.744	J1	1	Amphenol PCIM Mic. Connector
22.745	J2	1	Mallory A2 Ckt. Closing Jack
22.746	J3-4	2	Amphenol 83-1R Receptacles
22.747	H1-2	2	Amphenol 83-1H Hood
23.914-1	SH1-SH2	2	100 M.V. Shunt for 500 ma.
22.771	SH3 SH4	2	100 M.V. Shunt for 25 ma.
22.113-5	G8-12	5	Rubber Grommet 11/32 OD x 1/8 ID
22.712	SH5	1	100 M.V. Shunt for 50 ma.
SNC# P1783	L1	1	10 h 320 ma Filter Choke
SNC# P1501	L2	1	15 h 95 ma Filter Choke
SNC# P1784	L3	1	10 h 35 ma Filter Choke
23.902-1	L4	1	Oscillator Coil
23.902-2	L5A	1	Buffer Coil
23.902-3	L10	1	160 Meter Aux. Coil
102-750	L6	1	750 R. F. Choke
102-754	L7	1	754 R. F. Choke
23.911	L8	1	Residual H. F. Final Coil
229-201	L9	1	Final Tuning Inductor
23.912	L11	1	Parasitic Suppressor
23.913	L5B	1	H. F. Buffer Coil
SNC# P1781	T1	1	H. V. Plate Transformer
SNC# P1782 or P1893	T2	1	L. V. and Fil. Transformer
SNC# P1503	T3	1	Audio Driver Transformer
SNC# P1785 or P1992	T4	1	Modulation Transformer
22.755	SW1	1	SPST (6A-125V) Bat Handle Toggle Switch
22.756	SW2	1	DPST (6A-125V) Bat Handle Toggle Switch
22.757	SW3	1	3 Pole 2 Pos. (CW-PH) Switch
22.758	SW4	1	2 Pole 6 Pos. (Band) Switch
22.759	SW5	1	1 Pole 7 Pos. (Coupling) Switch
22.769	C8	1	.5 mfd 600 V. [illegible] Paper Condenser

22.760	SW6	1	2 Pole 2 Pos. (160) Switch
22.761	SW7	1	2 Pole 6 Pos. (Meter) Switch
22.628	SW8	1	1 Pole 11 Pos. (Crystal) Switch
167-104-2	C18	1	75L15 Variable Condenser
167-104-3	C22	1	75 mmf. variable condenser with long shaft
154-2-3	C29	1	350E20 Variable Condenser
154-2-1	C30	1	350E20 Variable Condenser
22.763	C1	1	10 mfd 25 V. W. Electrolytic Cond.
22.764	C10 C11	1	Dual 15-15 mfd 450 V. W. Electrolytic Cond.
22.765	C12 C13	1	Dual 15-15 mfd 150 V. W. Electrolytic Cond.
22.766	C2	1	.003 mfd 400 V. W. Paper Condenser
22.767	C3 C6	2	02 mfd 400 V. W. Paper Condenser
22.768	C4	1	.1 mfd 400 V. W. Paper Condenser
22.770	C5	1	.01 mfd 1000 V. W. Molded Tubular Cond.
22.771	C9	1	8 mfd 1000 V. W. Oil Filled Condenser
22.773	C14	1	50 mmfd 450 V. W. Molded Mica Condenser
22.774	C33 C34 C35	3	300 mmfd 450 V Molded Mica Condenser
22.772	C36 C37 616 C24 C26 C27	2	300 mmfd 600V Mica Condenser
22.775	C15 C17 C19 C21 C23 C39 C40	11	.005 or .0047 mfd 450 V. W. Mica Condenser
22.776	C20	1	50 mmfd 450 V. W. Silver Mica Condenser
22.777	C25	2	25 mmfd 450 V. W. Silver Mica Condenser
22.778	C38	1	150 mmfd 1200 V. W. Mica Condenser
22.779	C28 C31	2	.002 or .0022 mfd 1200 V. W. Mica Condenser
22.545	C32	1	.01 mfd 1200 V. W. Mica Condenser
22.719	R1	1	1 megohm - 1/2 Watt Resistor
22.715	R2	1	2000 ohm - 1/2 Watt Resistor
22.718	R3 R18	2	.47 Megohm - 1/2 Watt Resistor
22.716	R5	1	24,000 or 22,000 ohm - 1/2 Watt Resistor
22.714	R7	1	220 ohm - 1/2 Watt Resistor
22.717	R23	1	51,000 ohm - 1/2 Watt Resistor
22.728	R4 R9	2	.24 or .22 Megohm - 1 Watt Resistor
22.726	R8	1	51,000 or 47,000 ohm - 1 Watt Resistor
22.722	R15	1	1500 ohm - 1 Watt Resistor
22.721	R16	1	820 ohm - 1 Watt Resistor
22.724	R17 R24	2	2700 ohm - 1 Watt Resistor
22.727	R19	1	62,000 or 68,000 ohm - 1 Watt Resistor
22.720	R20 R26	2	100 ohm - 1 Watt Resistor
22.723	R27	1	2000 ohm - 1 Watt Resistor
22.725	R21	1	4700 ohm - 1 Watt Resistor
22.713	R22	1	22 ohm - 1/2 Watt Resistor
22.731	R6	1	.5 Megohm Linear Volume Control
22.732	R25	1	25,000 ohm W. W. Potentiometer
22.729	R13	1	20,000 ohm W. W. Adjustable Resistor
22.730	R28	1	10,000 ohm W. W. Fixed Resistor
22.762	M1	1	5 ma Meter 20 ohm
22.21	I1	1	#6S6 120 Volt Candelabra bulb
22.743	I2	1	#40 6-8 Volt min. screw bulb

STANDARD WARRANTY

Adopted and Recommended by the
Radio Manufacturers Association

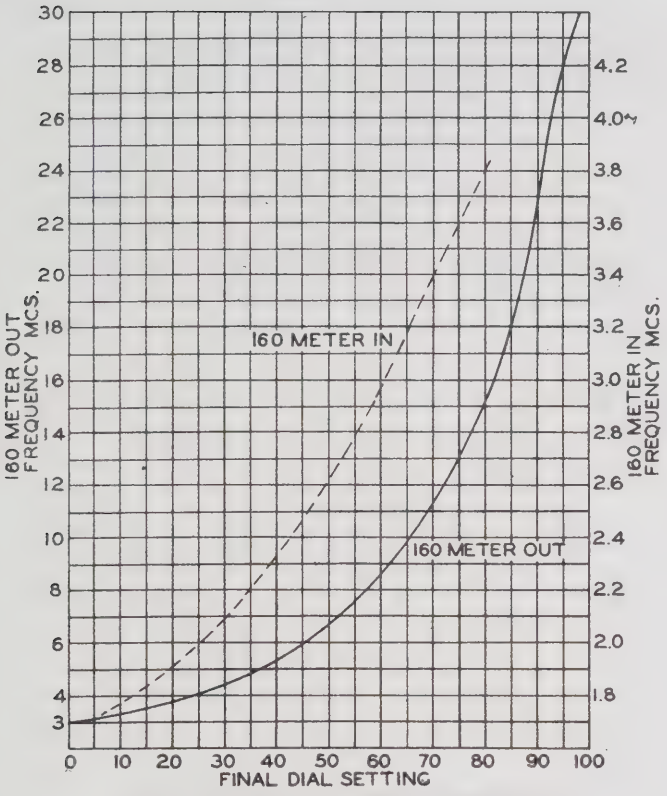
The E. F. Johnson Company warrants each new radio product manufactured by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit of its manufacture which under normal installation, use and service discloses such defect, provided the unit is delivered by the owner to us or to our authorized radio dealer or wholesaler from whom purchased, intact, for our examination, with all transportation charges prepaid to our factory, within ninety days from the date of sale to original purchaser and provided that such examination discloses in our judgment that it is thus defective.

This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, nor extend to units which have been repaired or altered outside of our factory, nor to cases where the serial number thereof has been removed, defaced or changed, nor to accessories used therewith not of our own manufacture.

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized radio dealer or wholesaler without charge to the owner.

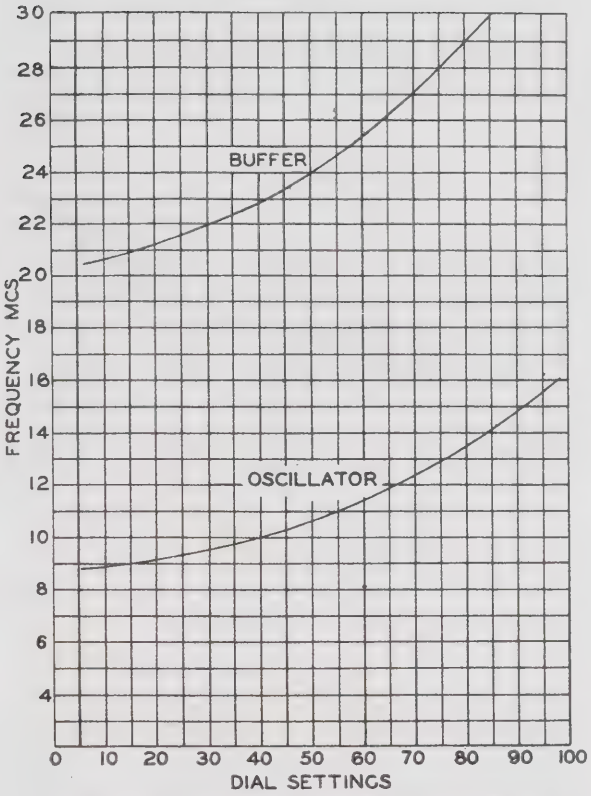
This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our radio products.

CURVE 1



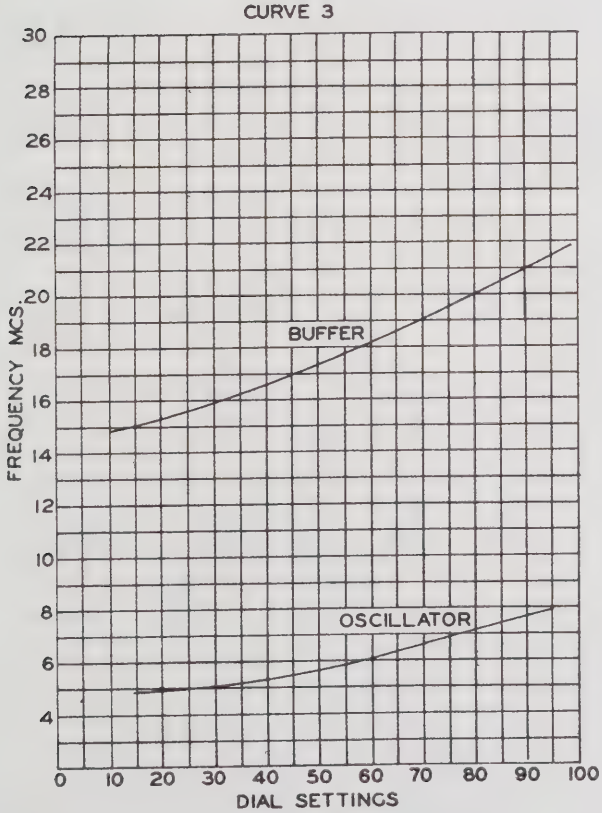
FINAL AMPLIFIER TUNING CALIBRATION
VIKING I TRANSMITTER SERIAL 397
LOADED TO FULL OUTPUT INTO 50 OHMS RESISTANCE

CURVE 2



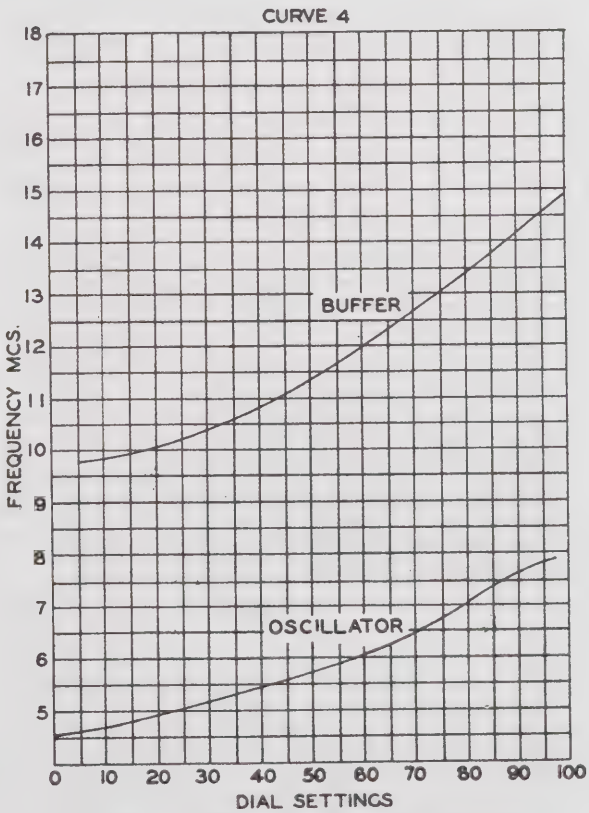
EXCITER CALIBRATION 10 METER BANDSWITCH
POSITION VIKING I TRANSMITTER SERIAL 397

CURVE 3



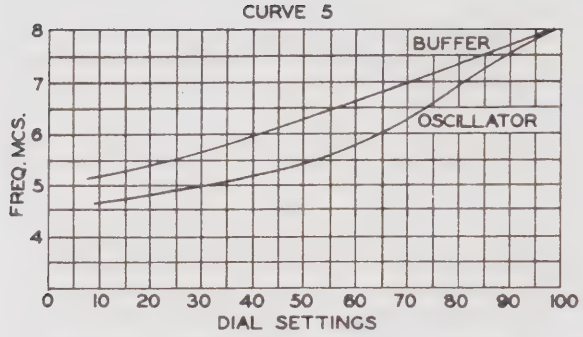
EXCITER CALIBRATION 15 METER POSITION

CURVE 4



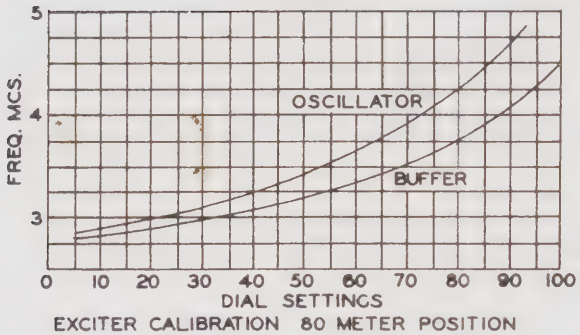
EXCITER CALIBRATION 20 METER POSITION

CURVE 5



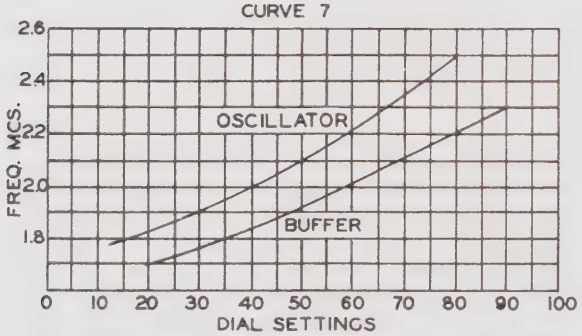
EXCITER CALIBRATION 40 METER POSITION

CURVE 6



EXCITER CALIBRATION 80 METER POSITION

CURVE 7



EXCITER CALIBRATION 160 METER POSITION

TABULATED DATA

Typical conditions, amplifier fully loaded into 50 ohms resistance

Curve #1

Freq.	Final Tuning Setting	Coarse Coupling	Fine Coupling	Remarks
30 MC	98.5	7	55	160 Meter Out
28	95	7	55	"
21	88	7	48	"
14	77	6	45	"
7	51.5	4	98	"
3.839	20	2	74	"
3.610	15	2	70	"
3.610	79	7	100	160 Meter In*
1.994	23	4	38	"
1.805.	11	3	50	"

*Not fully loaded

Curve #2

MO or XTAL Freq. MC.	Oscillator Setting	Buffer Setting	Buffer Output Freq. MC.	P.A. Grid M.A.	Minimum M.O. Voltage Required For P.A. Grid M.A.
15 MO	92	86	30	15 Plate Off	0.8 V
14	85	75	28	15 Plate Off	0.95
				10 Plate On	0.95
				15 Plate On	1.95
12.8	77	62	25.6	15 Plate Off	6.4
10.8	51	20	21.2	15 Plate Off	1.4
9.34	23				
9.07	17				
7.00 XTAL	85	75	28	16.5 Plate Off	
				13.5 Plate On	
7.00 MO	85	75	28	15 Plate Off	5.6

Curve #3

7.6 MC	88	100+	22.8		
7.0	79	85	21.0	15+	XTAL
7.0	79	85	21.0	15	2.2 V
6.0	58	58	18.0	15	7.0
5.0	25	25	15.0	15+	XTAL

Curve #4

7.3	83	93	14.6	15	1.4 V
7.0	80	86	14.0	15	1.1 V
7.0	80	86	14.0	15+	XTAL
6.0	60	61	12.0	15	1.4 V
5.0	26	16	10.0	15+	XTAL
4.95	23	98	14.85		XTAL
4.80	16	4	9.60	15	XTAL

Curve #5

8.0	100	98	8	15	1.0 V
7.6	90	85	7.6	15	.92 V
6.0	67	42	6.0	15	.45 V
5.0	34	0	5.0	15+	XTAL

NOTE: The use of 80 meter crystals and doubling in the oscillator stage is satisfactory for 40 meter operation.

Curve #6

4.53	85	100	4.53	15+	XTAL
4.00	72	87	4.00	15+	XTAL
3.5	52	66	3.50	15	.2 V
3.0	22	34	3.00	15	.25 V
2.8	5	11	2.80	15	.7 V

Curve #7

2.4	73	97	2.4	15	.3 V
2.3	65	87	2.3	15	.3 V
2.0	38	57	2.0	15	.35 V
1.9	30	50	1.9	15	.35 V
1.8	15	34	1.8	15	.45 V

ASSEMBLY INSTRUCTIONS

JOHNSON Viking I Transmitter

Success in assembling a piece of radio equipment such as the Viking I requires only that the instructions be followed implicitly, that the work be divided into sections which may be easily checked for correctness and completeness. This instruction manual was written by assembling a transmitter from standard production material and each step in the exact order of assembly described fully. It is a good plan to read over each description of the operation, perform it and then using the schematic diagram, check to see if your interpretation agrees with the schematic. As you go along you will be surprised how very familiar with the transmitter you become. Even with this, it is inevitable that some small mistakes will be made, however, by the time the transmitter is finished, these mistakes can be found readily by following the test procedure.

Mounting the front panel is postponed until one of the last operations to avoid the possibility of scratching up the panel. The parts which mount on the front of the chassis behind the front panel are equipped with two mounting nuts so that it is not necessary to remove them in order to mount the panel when that stage is reached.

Where chassis grounds are made with screws and nuts, be certain to use shakeproof washers as the etching process used in finishing the chassis leaves a small amount of oxide which increases surface resistance.

W A R N I N G

The voltages encountered in this piece of equipment are high enough to cause fatal injury! Practice safety rules until they are second nature. Always turn off the high voltage before making any adjustment inside the transmitter. Never depend on a bleeder resistor to discharge filter condensers. After the power is turned off, short circuit the high voltage circuit. Never operate the transmitter with any other than the recommended fuse in the primary circuit. The fuse will protect your equipment, in the case of accidental contact with the high voltage, it may save your life. If children have access to the transmitter, always disable the primary circuit by removing the fuse or the high voltage circuits by removing the rectifiers.

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Be sure and return the enclosed warranty registration card. This will permit the mailing of additional information from time to time.

NOTICE

The regulations of the Federal Communications Commission require an amateur license for operation of this equipment. Refer to publications of the American Radio Relay League for the latest applicable rules.

VIKING I TRANSMITTER

Assembly Instructions

1. In order to be able to work on the transmitter in an inverted position without damaging the parts mounted above the chassis, four legs roughly 3/4" x 1-1/4" x 9" should be made of scrap wood. Four 7/32" diameter holes are provided in each end of the chassis for the 1" 10-32 machine screws and nuts supplied for bolting the legs to the chassis.

2. Mount all the tube sockets, the VFO power socket and the crystal selector socket in the positions shown on Figure 1, according to the following directions.

   a. Mount socket X5, 7 pin miniature with shield base (120-277B) using 3/16" 4-40 machine screws, with nuts on top of the chassis, shakeproof washers and nuts. It is necessary to place the nuts on top of the chassis to avoid danger of short circuits between socket terminals. A #6 solder terminal (16.104-1) should be fastened under the mounting screw nearest the outside edge of the chassis. The 6AQ5 buffer/doubler plate terminal (pin 5) should be toward the front of the chassis.

   b. Mount socket X6 also a 120-277B in the same manner with the 6AU6 oscillator plate (pin 5) toward the front of the chassis and a #6 solder terminal under the mounting screw nearest the outside edge of the chassis.

   c. Mount socket X1 (120-277B) the same way with the 6AU6 audio amplifier control grid (pin 1) toward the front of the chassis and a #6 soldering terminal under the screw nearest the end of the chassis.

   d. Mount X2 for the 6AU6 in the same way.

   e. Mount socket X11, 7 pin miniature (120-277B) for the 6AL5 bias rectifier above the chassis with plate 2 (pin 2) to the rear. Use 3/16" 4-40

screws, shakeproof washers and nuts.

f. Mount socket X4, 5 pin ceramic wafer (122-225) under the chassis with the cathode terminal of the 807 (pin 4) to the front of the chassis. Use 1/2" 6-32 screws, shakeproof washers and nuts.

g. Mount socket X3, 5 pin ceramic wafer (122-225) in the same way with the 807 screen grid terminal (pin 2) toward the front of the chassis.

2. h,i. Mount socket X8 and X9, octal ceramic wafer (122-228) for 5R4G rectifiers under the chassis with blank terminals (pin 7) to the rear of the chassis. Use 1/2" 6-32 screws, shakeproof washers and nuts.

j. Mount X7, 7 pin large shielded wafer socket (122-101-8) for the 4D32 amplifier with the control grid (pin 6) toward the chassis front. Terminals are marked on the bottom of the steatite body of the socket. Subpanel mount the socket by means of the 1/2" spacers (13.49-9) and 3/4" x 8-32 screws, lockwashers and nuts. Also use shakeproof washers under the heads of the mounting screws.

k. Mount socket X10 octal wafer (122-228) for the 5Z4 low voltage rectifier with pin 7 to the rear of the chassis. Mount with 1/2" 6-32 screws, shakeproof washers and nuts.

l. Mount X12, the octal ceramic wafer VFO power socket (122-228) on the rear edge of the chassis (on the right side with the chassis inverted) with the key slot away from the corner of the chassis. Use 1/2" 6-32 screws, shakeproof washers and nuts.

m. Mount X15, the crystal selector socket only (126-120) atop the chassis so that its numbers appear correctly from the front of the chassis. Use 1/2" 6-32 screws, shakeproof washers and nuts. The front screws need not be tightened as the nuts will have to be removed later.

3. Mount the fuse post and the six terminal strips shown in the photo Figure 2 as follows:

a. Mount the fuse post X16 on the rear edge of the chassis in the top hole beside the VFO socket X12. The body terminal should be accessible for wiring later.

b. Mount terminal board X17 a 5 terminal strip by means of 3/16" 4-40 machine screws, shakeproof washers and nuts beside the fuse post X16 with a #6 soldering terminal under the mounting nut nearest the top of the chassis.

c. Mount terminal board X18 (also 5 terminal) in the same way parallel to the front of the chassis beside the sockets for 807 modulators (X3,X4) with a #6 soldering terminal under the nut nearest the center of the chassis.

d. Mount terminal board X19 (also 5 terminal) at right angles to the front of the chassis between and slightly to the rear of the 6AU6 audio amplifier sockets (X1, X2) with a #6 soldering terminal under the nut nearest the rear of the chassis.

e. Mount terminal board X20, a 6 terminal strip by means of 3/16" 4-40 screws shakeproof washers and nuts at right angles to the front of the chassis between the 4D32 socket (X7) and the 6AU6 oscillator socket (X6) with a #6 soldering terminal under each nut.

f. Mount terminal board X21 in the same way at right angles to the front of the chassis beside pin 7 of the socket X7 with a #6 soldering terminal under the nut nearest the front of the chassis.

g. Mount terminal board X22 the same way at right angles to the front of the chassis opposite pin 1 of the 5R4 socket X9 with a #6 soldering terminal under the rear nut.

4. Make all the grounds to the chassis as follows using #20 tinned wire except where noted otherwise. The #20 wire (W2) should have the insulation stripped off for the very short leads.

a. On socket X5 for the 6AQ5 buffer ground the center shield and pin 3 to the soldering terminal under the socket mounting nut and solder.

b. Ground the center shield and pins 2 and 3 of the 6AU6 oscillator socket X6 to the soldering terminal under one of the mounting nuts and solder.

c. Ground pins 2, 4 and the center shield of socket X1 to the soldering terminal under the nut and solder all except pin 2.

d. Do the same to socket X2 and solder all connections.

e. Connect pin 1 of 5Z4 socket X10 to pin 3 and center shield of socket X11. Leave a 2 inch length at X11 to be later grounded. Solder all connections.

f. Ground pin 5 of the 807 socket X4 and pin 5 of the 807 socket X3 to the nearest #6 soldering terminal under one of the terminal board X18's mounting nuts and solder.

g. Run a 5/8" 4-40 screw thru the rivet hole in socket X7 between pins 4 and 5 and secure beneath the socket with a lockwasher and nut. Mount two #6 soldering terminals on the screw using another shakeproof washer and nut. One lug should be turned toward the solder terminal of pin 4, one toward the solder terminal of pin 5. Connect a piece of #14 tinned wire to pins 7 and 4 of socket X7 and leave 2-1/4" extending from pin 4. Solder to the socket lugs. Make certain that the lead clears all the other tube terminals.

h. Ground each end terminal of the terminal board X20 to the corresponding ground lug under the mounting nuts. Solder the ground ends only.

i. Connect the 4th terminal from the rear of terminal board X22 to the ground lug under mounting nut. Do not solder.

j. Connect the two rear terminals of X19 to the solder terminal under the mounting nut. Do not solder.

k. Using W2 wire connect pins 1 and 2 of the VFO socket X12 together and to the solder terminal under the mounting nut of terminal board X17 on the rear edge of the chassis and solder.

5. a. Mount bracket BKT 4 (16.857.2) for the 160 meter auxiliary switch SW6 atop the chassis in the position shown on Figure 1. The mounting holes are approximately 4-1/2" from the front of the chassis slightly to the right of the center. These holes are behind the pair of half-inch holes (spaced 2" apart) provided to permit the drive cable to pass thru the chassis. The horizontal edge through which the screws pass should be toward the chassis rear. Use 1/4" 6-32 binding head screws, shake-proof washers and nuts.

b. Mount bracket BKT5 (16.857-2) in exactly the same manner under the chassis in the pair of holes in front of the 1/2" cable clearance holes. See Figure 2. The horizontal edge should be to the rear.

c. Mount SW6, the 160 meter auxiliary switch on bracket BKT4 with the shaft toward the front of the chassis and indexing ball toward the left edge of the chassis. The SW6 assembly screws should be on a line perpendicular to the top of the chassis. Use a 3/8"-32 nut and 3/8" shakeproof washer.

d. Install the drive pulley D3 (23.909) on the shaft of SW6 with the hub side toward the front of the chassis. The opening in the rim should be downward (toward the chassis) with SW6 turned to its counter-clockwise position looking at the end of the shaft. The pulley should be centered over the half-inch holes provided for passing the drive cable thru the chassis.

e. Mount the shaft and bearing assembly D-15 (115-256-16) in bracket BKT5 with the shaft extending through the front edge of the chassis as shown in Figure 2. The nut should be toward the front.

f. Mount pulley D4 (23.909) on the rear end of D-15 the hub toward the front of the chassis and the rim of D4 centered over the 1/2" chassis holes.

g. Cut a 34" length of dial cord D7 (42.49-150). Slip one of the dial cord tension springs D9 on the cord, tie it in the center of the cord with an overhand knot.

h. Hook the tension spring D9 on either of the ears of D3. Check SW6 to be sure it is still in the counter-clockwise position.

i. Fasten a knob on the shaft D15 so that in the process of stringing the dial cable you can keep the pulley D4 from turning.

j. Pass one end of the cable D7 thru the break in the rim of the pulley D3, around D3 in a counter-clockwise direction looking from the front of the chassis and thru the corresponding 1/2" hole in the chassis.

k. While holding the end of the dial cable under the chassis, turn the knob on the shaft D-15 so that the break in the rim of the pulley D-4 is nearest the chassis. Holding the knob with the left hand string the cable around the pulley D4, thru the break in the rim and under the nearest ear on the pulley. Hold the pulley and dial cord with the right hand, using a screwdriver push the ear of D-4 so that it grips the dial cord. Tension need not be kept now since the critical dimensions are now set and if the cable falls off the pulleys it can be readily re-strung. Tie an overhand knot in the clamped end of the cable, slide the knot down to where the cable is clamped and draw the knot tight.

1. Twist the knob on shaft D-15 in a counter-clockwise direction so that the dial cord is now under tension. String the thus far unused end of the dial cord around the pulley D3 in a clockwise direction, thru the corresponding 1/2" hole in the chassis, around pulley D4 in a clockwise direction. Now holding D4 and the cable in the right hand clamp down the other ear of D4 over the cable. Tie an overhand knot in the end of the cable and slide it down tight against the ear and draw tight. Check the cable to make sure that there is no backlash in the switch operation and that the cable does not cross on the pulleys causing them to bind. Trim off excess length of cable, leave about 1/2 inch.

6. a. Mount bracket BKT8 (16.1001-1) atop the chassis just to the right of the socket X5 by means of a 3/8" 10-32 machine screw, shakeproof washer and nut. The bend in the bracket should be toward the front of the chassis. This is the bracket holding switch SW4 in Figure 3.

b. Locate the exciter bandswitch SW4. Looking at the rear deck of the switch from the rear and with the blank section of the switch to the left call the topmost lug #1 and the next one #2 and so on around the switch deck in a clockwise direction the last one being lug #7. Connect R21 (4700 ohms 1 watt) between lugs 1 and 4 of the rear deck, jumper lug 4 to lug 3, solder at lug 3. Connect R22 (22 ohm 1/2 watt resistor) between lugs 4 and 5, do not solder. Bend R22 back toward switch.

c. Mount SW4 in bracket BKT8 using the 3/8-32 nut and shakeproof washer. Looking from the front of the chassis, the switch should be turned so that the lugs of the rear deck are toward the left end of the chassis and the switch assembly screws on a line perpendicular to the top of the chassis.

d. Connect a jumper of SW2 wire between terminals 1 and 7 of the rear deck of SW4. Do not solder.

e. Insert one of the small grommets in the chassis hole under lug #7.

f. Slip 1/2" of spaghetti over one of the leads of R20 (100 ohms 1/2 watt) pass this lead and spaghetti thru the grommet hole from underneath the chassis and solder to lug #7 of the switch. The spaghetti is to provide good RF insulation, the grommet to prevent abrasion.

g. Considering now the front deck of SW4 looking at it from the front of the chassis, call the top most lug #1 the next one in a clockwise direction #2 and so on around the bottom lug being #7.

h. Connect a jumper of SW2 wire from lug #1 to lug #7 of the front deck. Do not solder.

i. Install a grommet in the hole under lug #7 and install R26 (100 ohms 1/2 watt) following the same procedure as in (f) above. Also slip one of the leads of C23 (.005-450V mica) into the spaghetti from under the chassis and solder to lug #7.

7. a. Mount the buffer/doubler coil L5A (23.902-2) just to the right (looking from the front of the chassis) of the rear deck of the bandswitch SW4 and directly in front of the 4D32 socket, using shakeproof washers and 6-32 nuts. The coils terminals will be toward the left end and slightly toward the front of the chassis. See Figure 4. Coils L4, the oscillator coil and L5A the buffer coil are quite similar, the difference being that the bottom 5 turns of L4 are space wound.

b. Connect the top lead of the coil L5A to lug #1 on the front deck of SW4 and solder.

c. Connect the tap of coil L5A (approximately 50 turns from the top) to lug #2 on the front deck of SW4 and solder. Use #24 tinned bare wire

for connections to the taps of L5A.

d. Connect the next lower tap on coil L5A to lug #3 of the front deck of SW4 and solder.

e. Connect the next lower tap on coil L5A to lug #4 of the front deck of SW4 and solder.

f. Connect the bottom lead of coil L5A to lug #5 of the front deck of SW4. Do not solder.

8. a. Mount the oscillator coil L4 atop the chassis by means of shakeproof washers and 6-32 nuts behind and slightly to the left of SW4 looking from the front of the chassis. Refer to Figure 5. The coil's terminals will be toward the left end of the chassis looking from the front.

b. Connect the top lead of coil L4 to terminal #1 of the rear deck of SW4 (refer to Section 6b) and solder.

c. Connect the tap (down approximately 50 turns from the top) of coil L4 to lug #6 on the rear deck of switch SW4 and solder. Wire all the taps of L4 with #24 tinned bare wire.

d. Connect the next lower coil tap of L4 to lug #3 of the rear deck of SW4 and solder.

e. Connect the tap nearest the bottom of L4 to lug #2 of the rear deck of SW4. Leave the bottom lead of coil L4 hanging for the time being.

f. Solder lugs 4 and 5 on the rear deck of SW4.

g. Insulate one lead of C19 (.005 mfd. 450 volt mica) with a 1" piece of spaghetti. Pass it between the decks of SW4 from the left end of the chassis and solder to lug #7 on the rear deck of SW4. The lead should be between the shaft and the bottom spacer of SW4. C19 will be connected later to the oscillator tuning condenser.

9. a. Mount the high frequency buffer coil L5B (23.913) in front of the

buffer coil L5A, its axis parallel to the front of the chassis and the tap to the rear, as per Figure 4. The #14 lead of L5B passes thru a hole in the chassis. Use 6-32 x 3/8" screws and shakeproof washers furnished on L5B's insulators and at the same time mount the bracket BKT6 (16.857-2) under the chassis, the edge through which the mounting screws pass toward the rear of the chassis. This bracket is for the buffer tuning condenser C22. See Figure 10, the item of C22.

b. Connect the strap on the left end of the coil L5B, looking from the front of the chassis, to lug #5 on the front deck of the bandswitch SW4 and solder.

c. Connect the tap of L5B to lug #6 on SW4 and solder.

d. Loosely fasten the excitation control R25 (25,000 ohm 4 watt potentiometer) to the bracket BKT9 (16.1001-1) by means of its mounting nut. Mount bracket BKT9 on the chassis flush with the front edge directly in front of the coil L5B, shaft of R25 to the front with a 3/8" 10-32 screw, shakeproof washer and nut. Rotate R25 so that the lugs point toward the left edge of the chassis looking from the front, as seen in Fugure 4. Tighten the nut on R25.

e. Check to make sure all joints in the buffer compartment are soldered.

10. a. Using 1/4" 6-32 binding head screws, shakeproof washers and nuts fasten shield S4B (17.755) to shield S4A (17.756). In order to see the positions of these shields slip the smaller of the shields between the decks of SW4. The slot in the small shield will clear the switch. Place the larger of the shields atop the chassis the edge having punched holes down. The shield will fit between the 4D32 socket and the oscillator coil L4, between the buffer coil L5A and the 4D32 socket. The front edge of the shield will be beside the potentiometer R25. After

Screwing the shields together put them back in the position just described and note the locations of the mounting holes for the shields which coincide with the holes punched in the lower edge of the shields. Using 1/4" 6-32 binding head screws, shakeproof washers and nuts fasten the 6-32 spade lugs to the shields being careful to get spade lug on the correct side of the shields. This can be seen by referring to Figures 4, 5 and 7. The shields will fit nicely into the 7 holes provided without the necessity of distorting the shape of the shields. Secure the shields under the chassis with 6-32 nuts and shakeproof washers. The job is simplified if the spade lugs are not particularly tight. The spade lugs can then be moved slightly in order to get them into their respective holes. The screw holding the spade lug near the buffer coil L5A must be inserted in the shield screwhead toward L5A otherwise the coil will be scraped in assembly. Mount a # 6 soldering terminal under the spade lug nut nearest pin 4 of socket x7. Trim and solder the # 14 wire extending from pin 4 to this ground terminal.

b. Mount the oscillator tuning condenser C18167-104-2 (75L15 JOHNSON) on the hole in the shields next to the switch SW4 stator section toward the chassis as shown in Figures 4 and 5. The contact of C18 should be turned 90 degrees toward the center of the chassis.

c. Connect the .005 mica condenser C19 previously connected to lug #7 of the rear deck of SW4 to the rotor terminal of C18 and solder.

d. Install a grommet in the hole beside the 6AU6 oscillator tube socket X-6.

e. Connect the bottom lead of the oscillator coil L4 and a 2" length of wire W2 to the nearest stator terminal of C18 and solder. Run the wire W2 thru the grommet just installed in (d).

f. Slip the split sleeve coupling D18 on the shaft of C18. Slide the 1/4 x 2 1/4" shaft extension D13 into the coupling from the front. Center the ends of the shafts in the coupling D18 and secure.

11. a. Mount the final inductor L9 atop the chassis in exact center over the six ventilation holes near the front edge. The front of the inductor is the end where the spacing between turns is least and should be toward

the front edge of the chassis. Use 3/8" 8-32 screws, shakeproof washers and nuts.

b. Connect a piece of #14 tinned wire between the solder terminal on the front end of L9 and one of the flat #10 solder terminals furnished, on the 8-32 screw terminal on the same end of the inductor.

c. For convenience in shipping the tuning mechanism BKT1 (23.900-1), the gear which will be later used to drive the condenser C29, has been fastened to the inductor drive shaft and pinion. This gear should be removed so that the drive shaft is free to slide back and forth in its bearing. Mount the flexible coupler D16 (104-250-51) on the drive shaft on the end next to the small gear.

d. Loosen the other pair of set screws in the flexible coupler D16, mount the tuning mechanism BKT1, the outside of the bend in the bracket to the front of the chassis. BKT1 mounts directly in front of the final inductor L9, the rear end of the flexible coupler D16 over the shaft of L9. Use 3/8 10-32 screws, shakeproof washers and nuts.

e. Loosen set screws in the flexible coupler D16 and adjust its position on the shafts so that it can move freely and take care of any slight misalignment of the shafts. Tighten all four set screws in D16.

f. Mount BKT2 (17.754-1) behind the final tuning inductor L9 outside of the bend in the bracket toward the right edge of the chassis looking fron the front. Refer to Figure 6. Use 3/8" 10-32 screws, shakeproof washers and nuts.

g. Mount bracket BKT3 (17.752-1) between brackets BKT1 and BKT2 using 10-32 screws and shakeproof washers. Loosen the top bearing in BKT1 but do not remove.

h. Take the gear removed from the drive shaft of BKT1 hold it behind the

top bearing in BKT1, hub side to the chassis rear, set screws up and with the gear teeth in mesh with the small gear near the center of BKT1. Pass the shaft of condenser C29 (154-2-3) thru the hub of the gear and the bearing in BKT1. Permit C29 to rest on the final inductor L9.

i. Fasten the mounting feet provided in the hardware envelope Hw. 438 (23.08-1) on the variable condenser C30 (350E20).

j. Pass 1/2" 6-32 screws thru the mounting feet on C29, thru the holes in brackets BKT3 and thru the mounting brackets of C30. Fasten with shakeproof washers and nuts. The long shaft of C30 should be toward the front edge of the chassis.

k. With the roller of the inductor L9 at the front stop and with C29 fully meshed, adjust the position of the gear on the shaft of C29 so that the groove in the gear's hub clears the gear below and tighten set screws.

l. Tighten the top bearing in BKT1. Attach a knob temporarily to the final tuning shaft and check to see wherher or not this tuning assembly turns freely. If not, loosen the mounting screws of various components and realign. A drop of oil on the bearings of BKT1 on the outside ends of the bearings of L9 and the variable condenser C29 will aid in making the tuning smooth.

12. a. Using bracket BKT10, a 3/8" 10-32 screw, nut and shakeproof washer, mount the coupling switch SW5, as shown on Figure 3, directly under the front shaft of the output coupling condenser C30. The assembly screws should lie on a line perpendicular to the top of the chassis, the blank side of the switch to the left of the chassis looking from the front.

b. Attach two #6 soldering terminals to the front of the frame of the

output tuning condenser C30, as seen in Figure 6, one under the screw in the condenser mounting bracket nearest the condensers shaft, the other under the screw nearest the chassis on the right (lower frame rod). Connect a piece of #14 wire between these lugs and solder.

c. Starting with first lug to the right of the top screw in the switch SW5 (looking from the front), connect condensers C33, C34, C35, (300 mmf. 450 volt mica) each to one of the switch terminals around the switch in a clockwise direction from the front except the last three terminals. To the last lug connect C38 (150 mmf. 1200V mica). Connect C36 and C37 each 600WV mica to the two switch lugs still open. The other lead of all the condensers connect to the #14 wire on condenser C30 covered in operation 12-b. Solder all connections.

d. Fasten a #6 solder terminal under the nut of the bottom, front stator terminal of the output tuning condenser C30. Between this terminal and the two lugs on the top of SW5 (to the left of the top screw) connect a piece of #14 wire and solder.

13. a. Under convenient screws in the rear of the frames of condensers C29 and C30 connect a #10 soldering terminal on each condenser. Connect parallel #14 wires as short as possible between these lugs and solder. This is to provide a good low resistance bond between the two condensers.

14. a. Looking at the 160 meter switch SW6 from the rear of the chassis, as in Figure 6, call the first lug to the right of the top nut (used in assembling the switch) terminal #1. Call the others in order in a clockwise direction #2, #3 etc., around to the one just to the left of #1 which will be #12.

b. Fasten a #10 soldering terminal under the 8-32 screw terminal on the rear of the final inductor L9 and connect a piece of #14 wire

between this terminal and terminals #2 and #3 on the 160 meter switch SW6 and solder.

c. Connect a #10 soldering terminal on the bottom rear stator terminal of the coupling condenser C30. Solder a piece of #14 wire between this terminal and terminals #11 and #12 of the 160 meter switch SW6.

d. Mount the 160 meter auxiliary inductor L10 (23.902-3) atop the chassis directly behind switch SW6, as shown in Figure 7, and with the leads toward SW6. Secure with shakeproof washers and 6-32 nuts.

e. Solder the top terminal of L10 to terminals #5 and #6 of the switch SW6.

f. Solder the bottom terminal of L10 to terminals #8 and #9 of SW6. Terminals #1, #4, #7 and #10 will be left blank.

15. a. Using a 6-32 x 1/4" binding head screw and shakeproof washer, fasten bracket BKT13 to the plate coupling condenser C31 (.002 mfd. 1200WV mica) so that the bend in the bracket is parallel to the long axis of the condensers. See C31 in Figure 7.

b. Mount the bracket BKT13 on the bottom rear stator terminal of the tuning condenser C29 so that the condenser C31 projects upward. To this same terminal on C29 and at the same time mount the residual high frequency coil L8 (23.911) as shown in Figure 7, by means of its soldering terminal attached. Solder the plain wire end of L8 to the rear soldering terminal of the final inductor L9.

c. Mount the rf choke L7 (102-754) behind the 4D32 socket X7, using 1/4" 6-32 binding head screws, shakeproof washers and nuts. The bottom terminal of choke L7 should be to the rear of the chassis.

d. Fasten two #6 soldering terminals to the top end of the coupling condenser C31 by means of a 1/4" 6-32 screw and shakeproof washer. To.

one of the terminals solder a piece of #14 wire; the other end of the wire to the top terminal of the choke L7. To the other solder terminal on C31, solder the parasitic suppressor L11 (23.912). The suppressor lead to the C31 terminal should be as short as possible.

e. To the other end of L11 solder the 4D32 plate connector TC1 (119-854).

f. Mount the plate by-pass condenser C32 (.01 mfd. 1200 WV mica) atop the chassis behind the final inductor L9 in the position shown on Figure 7 the center line between the tapped holes of the condenser parallel to the front edge of the chassis. Mount the condenser by means of a 6-32 x 1/2" screw run thru a shakeproof washer, up thru the chassis and thru a 10-32 nut used for a spacer.

g. Fasten by means of a 1/4" 6-32 binding head screw a #6 soldering terminal to the end of C32 nearest the rf choke L7 and solder a piece of #14 wire between this terminal and the bottom terminal of L7.

h. Install a grommet in the hole directly behind L7.

16. a. Lay the wiring harness WI (26.182) in the chassis as shown in the illustration #8. Some of the leads in the harness will prove to be slightly long and may be trimmed to fit. For this reason the leads are not stripped. The plastic covering of the wire may be readily stripped using diagonal cutters, a knife or a wire stripper such as the General Cement #733A. An iron applied directly to the insulation will cause it to melt but the iron can be left on joints long enough for the solder to flow without affecting the insulation. Numbers of the leads of the wiring harness are given in the drawing Figure 11.

b. Connect green leads 13A and 14A to pin #1 of the 4D32 socket X7 and solder.

c. Connect orange lead 5B to the lug of the terminal strip X21 nearest

the front of the chassis. Do not solder.

d. Connect the white leads 6B and 21B to the fourth lug from the front of the chassis on terminal board X21. Do not solder.

e. Connect lead 22A black to the third terminal from the front of terminal board X21. Do not solder.

f. Connect the black-brown lead 23A to the second terminal from the front of terminal board X21. Do not solder.

g. Connect lead 47B (gray) to pin #2 of the 4D32 socket X7. Do not solder.

h. Run lead 49B (green-white) thru the grommet beside the rf choke L7 and solder it to the bottom terminal of L7.

i. Connect 39B and 40A, both violet, to the cathode terminal (pin 4) of the 807 socket X3 and solder.

j. Solder leads 14B and 15A, both green, to the filament terminal (pin #1) of the 807 socket X3.

k. Solder leads 45B and 46A, both yellow-blue, to the screen grid terminal (pin #2) of the 807 socket X3.

l. Solder lead 15B (green) to the filament (pin #1) of the 807 socket X4.

m. Solder lead 40B (the longest violet lead) to the cathode terminal (pin #4) of the 807 socket X4.

n. Solder lead 46B (yellow-blue) to the screen grid (pin #2) of the 807 socket X4.

o. Connect lead 22B (black) to the fourth lug from the edge of the chassis on terminal board X18. Do not solder.

p. Connect lead 43B (violet) to the terminal of the terminal board X18 nearest the edge of the chassis. Do not solder.

q. Connect leads 48B and 49A (both green-white) to the second terminal from the edge of the chassis on terminal board X18. Do not solder.

r. Connect leads 7B and 38A (both yellow) to the fifth terminal from the rear of the chassis on terminal board X22. Do not solder.

s. Connect leads 8B and 39A (both violet) to the lug of terminal board X22 nearest the center of the chassis. Do not solder.

t. Connect leads 27B and 28A (both black-brown) to the rear terminal of the terminal board X22. Do not solder.

u. Connect lead 32B (gray-red) to the second terminal from the rear of terminal board X22. Do not solder.

v. Connect lead 42A (violet) to the #1 pin of the forward 5R4 socket X9. Do not solder.

w. Connect lead 20B (green) to pin #3 of the 6AU6 socket nearest the corner of the chassis (X1) and solder.

x. Connect lead 9A (red) to the center terminal of terminal board X19. Do not solder.

y. Solder leads 19B and 20A (both green) to the #3 pin of the 6AU6 socket X2.

z. Install a grommet 22.113-1 in the hole between and in front of socket X1 and X2. Run leads 1A, 2A, 3A, 4A, 5A, 6A, 7A and 8A for connection later to the meter switch SW7.

aa. Solder lead 4B (black) to terminal under mtg. nut of socket X2.

17. a. Connect lead 25B (white) to the 6AQ5 buffer screen grid terminal pin 6 of socket X5 and solder.

b. Solder lead 3B (gray) to the cathode terminal of the 6AQ5 buffer pin 2 of socket X5.

c. Solder leads 17B and 18A (both green) to the filament terminal pin 4 of the 6AQ5 buffer socket X5.

d. Solder leads 16B and 17A (both green) to the filament pin #4 of the

6AU6 oscillator socket X6.

e. Solder lead 10B and 12A (both red) to pin #3 of the octal VFO power socket X12.

f. Solder leads 13B and 16A (both green) to pin #7 of socket X12.

g. Solder leads 23B and 24A (both black-brown) to pin #5 of socket X12.

h. Solder lead 50B (brown) to pin #8 of socket X12.

i. Connect lead 12B (red) to pin #3 of the 5Z4 rectifier socket X10. Do not solder.

j. Connect lead 29A (white) to the 4th terminal from the bottom edge of the chassis on terminal board X17. Do not solder.

k. Connect lead 31B (blue-orange) to the lug of terminal board X17 nearest the edge of the chassis. Do not solder.

l. Connect lead 27A (black-brown) to the center terminal of the board X17. Do not solder.

m. Using a short piece of the insulated hookup wire W2 connect lead 29A (white) on the terminal board X17 to the end lug of the fuse post X16. Solder.

n. Connect lead 1B (blue) to the cathode of the 6AU6 oscillator pin 7 of socket X6 and solder.

o. Connect lead 9B, 10A and 11A (all red) to the 3rd and 4th terminals from the front of the chassis on terminal board X20 and solder.

p. Connect lead 24B (black-brown) to the second terminal from the front of the chassis on terminal board X20. Do not solder.

q. Connect lead 34A (brown) and 50A (brown) to the 5th terminal from the front of the chassis on terminal board X20. Do not solder.

r. Install a grommet 22.113-1 in the hole directly under the excitation control R25 and bring up the leads for the excitation control to the

top of the chassis.

18. a. Using a bracket BKT11 (16.1001-1), a 3/8" 10-32 screw, shakeproof washer and nut, mount the meter switch SW7 atop the chassis on the extreme right hand end looking from the front. Do not use the shakeproof washer. Mount the switch so that the center line thru the switch assembly screws is perpendicular to the top of the chassis. The switch is symmetrical and may be turned so that either screw is toward the top. Looking at the switch SW7 from the rear, call the first lug to the right of the top screw lug #1, the next in a clockwise direction #2 and so on around the switch, the last one being lug #12.

b. Solder the brown lead to lug #6.

c. Strip 1-1/2" of insulation off the black lead, connect to lug #5, slip a piece of spaghetti over the exposed lead and solder to lug #9 also.

d. Connect the orange lead to lug #4 and solder.

e. Solder the yellow lead to lug #3, also to lug #2.

f. Solder the violet lead to lug #8.

g. Solder the white lead to lug #10.

h. Solder the gray lead to lug #11.

i. Solder the blue lead to lug #12.

j. Solder a 4" length of the hookup wire W2 to lug #7. This will later connect to the negative terminal of the meter.

k. Solder a 3" length of the wire W2 to lug #1, tag it in some manner so you can remember it connects to the positive terminal of the meter.

19. Wire the excitation control R25 as follows:

a. Connect the white wire to the center lug. Solder.

b. Looking from the front of the chassis, solder the black wire to the lug next to the center lug in a clockwise direction (top lug).

c. Solder the red wire to the lug next to the center lug in a counter-clockwise direction.

20. a. Mount bracket BKT12 atop the chassis outside of bend to the front between the switch SW7 (meter switch) and switch SW5 (output coupling switch) using a 3/8" 10-32 screw, shakeproof washer and nut.

b. Slip pulley D-5 on the long end of the bearing and shaft assembly D14 (115-256-15) hub side of D7 toward the bearing.

c. Slip D14 into the hole in BKT12 and secure with one of 3/32" mounting nuts. Do not use the nut furnished with D14, it is too thick.

d. Adjust the position of the pulley D5 on the shaft of D14 so that it clears the shield base of the socket X2 by 1/4" or so.

e. Slip pulley D6 (23.909) on the front shaft of the output coupling condenser C30, the hub to the rear. Adjust the position of the pulley so that it lines up with the pulley D5 with the opening in the rim toward the pulley D5 with the condenser C30 at full capacity.

f. With the pulley D5 turned so that the opening in its rim is toward SW-5, run a 1" 8-32 screw thru the topmost outside hole stamped in the pulley. Pass the screw thru the pulley from rear to front. Secure with a shakeproof washer and nut. This is the stop for the drive assembly.

g. Readjust the position of D5 on the shaft D14 so that the end of the screw installed in 20.f. is exactly flush with the front edge of bracket BKT12.

h. Now making use of the stop just provided, install the drive cable in exactly the same manner as the drive cable for the 160 meter switch

SW6 described in part 5-h. thru m. The tension spring should be fastened to the pulley D5 on the shaft assembly D14.

21. a. Mount the voltage divider R13 directly behind the 4D32 socket parallel to the front of the chassis, as shown in Figure 10. One of the resistor's mounting feet mounts under the screw for the plate by-pass condenser C32 which is on top of the chassis. Mount the other foot with a 1/4" 6-32 binding head screw, shakeproof washer and nut.

b. When the resistor was shipped from the factory, the shape of the tap was deliberately distorted so that it does not make contact with the resistance. This tap must be taken off the resistor, re-shaped and put back on the resistor. Tighten the tap carefully so as not to damage the fine wire with which the resistor is wound. Do not attempt to move the slider without first loosening it!

c. Connect the three violet wires 42B, 43A and 44A to the voltage divider R13 terminal nearest the center of the chassis. Solder.

d. Solder wire 41A (gray-red) to the tap on R13.

e. Solder wire 38B (yellow) to the end of the voltage divider nearest the edge of the chassis.

22. a. Mount the phone/CW switch SW3 in the center of the front edge of the chassis with the center line between the two screws used in the assembly of the switch perpendicular to the top of the chassis. Do not use shakeproof washer supplied. Note that the switch SW3 is symmetrical and that all the lugs are in groups of three. In order that you may stay properly oriented in wiring the switch, number any one of the center lugs of one of the groups of three lugs #1. Looking at the switch from the rear call the next lug in a clockwise direction #2 and so on, the last lug being #9.

b. Solder leads 2B and 34B (brown) to #1 terminal of the phone/CW switch SW3.

c. Solder lead 36A (blue) to lug #2.

d. Solder lead 45A (yellow-blue) to lug #3.

e. Solder lead 41B (gray-red) to lug #4.

f. Connect lead 47A (gray) to lug #5. Do not solder.

g. Connect the screen dropping resistor R-28 (10K ohms 20 watts) between lugs #5 and #6 of switch SW3. Use these lugs to support the resistor using a piece of #14 wire for one of the leads.

h. Solder lead 48A (green-white) to lug #7 of switch SW3.

i. Solder lead 44B (violet) to lug #8.

j. Solder lead 35A (orange) to lug #9.

23. a. Mount the high voltage indicator socket X13A (147-620) on the front edge of the chassis directly beneath the shaft which drives the 160 meter switch SW6 using a 1/4" 6-32 binding head screw, shakeproof washer and nut.

b. Connect lead 28B (black-brown) to one of X13's lugs, 33B (gray-red) to the other terminal and solder. Polarity need not be observed.

24. a. Mount the low voltage indicator socket X14A (147-600) on the front edge of the chassis beneath the excitation control R25 using a 1/4" 6-32 binding head screw, shakeproof washer and nut.

b. Solder leads 18B and 19A (both green) to one of X14A's lugs.

c. Solder a piece of wire W2 to the other lug of X14A, run it to the terminal under the front mounting nut of terminal board X21. Do not solder.

25. a. Mount the keying jack J2 in the front edge of the chassis directly under the bandswitch SW4 with the solder lugs of J2 toward the right

edge of the chassis, as in Figure 10. Discard the washer.

b. Solder the black lead 26B to the lug of J2 nearest the front edge of the chassis and also to the heavy lug which is part of the frame of the jack.

c. Solder the blue lead 36B to the lug of J2 nearest the top of the chassis.

26. a. Mount the bracket BKT7 (16.857-2) under the chassis on the front screws of the crystal selector socket X15 with the outside of the folded edge to the front of the chassis.

b. Using #24 tinned wire, connect the inside terminals of crystal positions 1, 2, 3, 4 and 5 on socket X15 all in parallel. This is done by running the wire parallel to the edge of the chassis thru each of the terminals and soldering.

c. In the same way connect the inside terminals of crystal positions 6, 7, 8, 9 and 10 in parallel.

d. Connect these two wires together using a piece of #24 wire running from the terminal #5 to terminal #6.

e. Mount the crystal selector switch SW8 (22.628) on the bracket BKT7 the shaft toward the front edge of the chassis. The switch should be turned so that the rotor terminal of the switch is up when the chassis is in an inverted position. Lugs 1 and 7 (see Next step) should be in a vertical line.

f. Looking at the switch from the rear, call the rotor lug #1 and the next lug in a clockwise direction #2 and so on around the switch, the last lug being #12.

g. Using #24 wire connect and solder switch lug #6 to the terminal of crystal position 6 on the outside edge of the crystal board.

h. In the same way connect and solder lug #7 of the switch to terminal of crystal position 5 on the outside of the crystal board.

i. Connect switch lug #5 to crystal position 7.

j. Connect switch lug #8 to crystal position 4.

k. Connect switch lug #4 to crystal position 8.

l. Connect switch lug #9 to crystal position 3.

m. Connect switch lug #3 to crystal position 9.

n. Connect switch lug #10 to crystal position 2.

o. Connect switch lug #2 to crystal position 10.

p. Connect switch lug #11 to crystal position 1. Lugs 1 and 12 on the switch are left unconnected for the time being.

q. Install one of the panel bearings D17 (13.123-7) in the hole in front of the chassis in line with the socket X5. The panel bearing should have one of the shakeproof washers off one of the switches behind the chassis for a spacer. The threaded portion of the bearing should extend thru the chassis to the front. Secure with one of 3/32" thick 3/8"-32 nuts.

r. Slip one of the split sleeve couplings D19 (104-258) on the shaft of the crystal selector switch SW8.

27. a. Mount the low voltage switch SW1 (SPST toggle switch) in the hole on the front of the chassis nearest the bottom of the chassis and between the phone/CW switch SW3 and the indicator socket X14A. Using one of the hexagonal 3/32" thick 3/8" x 32 nuts. The lugs should be toward the top of the chassis.

b. Solder the white lead 29B to one of the switch terminals, the lead 30A (blue-orange) to the other switch terminal.

28. a. Mount the high voltage switch SW2 (DPST toggle) perpendicular to the

top of the chassis using one of the 3/32" x 3/8" x 32 nuts in the hole nearest the top of the chassis between SW3 and the high voltage indicator X13A.

b. Connect lead 30B, also 31A (both blue and orange)to one of the center lugs of SW2.

c. To the terminal of SW2 nearest the top of the chassis and in line with the lug previously connected, solder leads 32A and 33A (both gray and red).

d. Solder the black lead 37A to the other center lug of SW2.

e. Connect the orange lead 35B to the lug of SW2 nearest the chassis and in line with the lug connected to the black lead previously. Solder.

29. Mount the buffer tuning condenser C22 167-104-3 / on the bracket located under the chassis beneath the excitation control R25, shown in Figure 10 as follows:

a. Slip the shaft of C22 thru the hole in the bracket toward the front of the chassis. Slide one of the 3/32" x 3/8" -32 nuts over the shaft

b. Tighten the nut on C22.

30. a. By pushing back on the solder lug of the rotor contact of C22 turn the contact so that the lug points toward the right hand end of the chassis.

b. Solder the .005 mica condenser C23 to this lug.

c. Solder the coupling condenser C25, 50 mmf. mica (consists of two 25 mmf. silver mica in parallel) between the left hand stator terminal of C22 and lug 6 of the 4D32 socket.

d. Solder the #14 lead of the auxiliary coil L5B which comes from the top of the chassis and a piece of W2 wire to the right hand stator terminal of C22. Be sure the #14 coil lead does not touch the chassis.

e. Solder the W2 wire to pin 5 of the buffer socket X5. Since this is an RF lead, keep it in the clear so it does not touch other objects.

f. Connect the 100 ohm 1/2 watt resistors R20 and R26 both to the third terminal from the front of the chassis on terminal board X20.

31. Operations 31, a thru o, can be seen on Figure 10.

a. Connect the W2 wire from the stator terminal of the oscillator tuning condenser C18 and the 50 mmf. silver mica condenser C20 to pin 5 of the oscillator socket X6 and solder.

b. Connect the other end of C20 and one end of R23, 50k ohms 1/2 watt resistor to the grid terminal of the 6AQ5, pins 7 and 1 of socket X5 and solder.

c. Connect the other end of R23 to the second terminal from the front of the chassis on terminal board X20. Do not solder.

d. Install a #6 soldering terminal under the spade bolt of the oscillator shield nearest the right hand edge of the chassis. Between this terminal and pin 2 of the 6AQ5 socket X5, solder C27, .005 mica 450 volts and SH5, 2.2 ohms 1/2 watt resistor.

e. Beside the left side of the terminal board X20 connect and solder the .005, 450 volt mica condenser C24 between the second terminal from the front on X20 and the ground lug under the front mounting

nut of X20.

f. Solder the .005 mfd., 450 volt mica condenser C26 between the filament pin of the 6AQ5 buffer pin 4 of socket X5 and the ground lug under the front mounting nut of terminal board X20.

g. Solder the .005, 450 volt mica condenser C21 between pin #6 of the 6AQ5 socket X5 and the front terminal of terminal board X20.

h. Connect the 50 mmf. mica condenser C14 to the closest of the common terminals of the crystal selector socket X15. Insulate the lead with spaghetti, solder.

i. Solder the other end of C14 and one end of the 1 watt 65,000 ohm resistor R19 to pin 6 of the 6AU6 socket X6.

j. Solder the other end of R19 to the third terminal from the front of the chassis on X20.

k. Solder the .005 mfd. 450 volt mica condenser C17 between the fourth terminal from the front of the chassis on terminal board X20 and the ground lug under the rear mounting nut of X20.

l. Solder C15, .005 mfd. 450 volt mica between pin 7 of socket X6 and the ground terminal on the rear of X20.

m. Solder C16, .005 mfd., 450 volt mica condenser between pin 4 of socket X6 and the ground terminal at the rear of X20.

n. Solder R18, 470k ohm 1/2 watt resistor and W2 wire to pin 1 of socket X6. Connect the other end of R18 to the ground terminal on the socket X6. Connect the other end of the W2 wire lead to the rotor terminal of the crystal selector/switch SW8. Keep this lead in the clear so it does not touch other objects.

o. Connect shunt SH5, 5 ohms 1/2 watt resistor between #7 pin of X6 and 5th terminal of X20 from front. This completes the wiring for the

oscillator and buffer stages except for the VFO input lead.

p. Slip the 1/4" x 5-1/2" shaft extension D11 (14.145-7) into the coupling D18 on the crystal selector switch SW8 center the ends of the shafts in the coupling D18 and secure.

32. a. Strip 2" of the outside vinylite covering from item G2 (71.32-178) RG59U cable used for VFO input lead. Push the shield braid back exposing the vinylite insulated center conductor. Strip the insulation back 1/4" on the center conductor and tin with solder. Fill the solder terminal of J3 (one of the Amphenol 83-IR receptacles) with solder. Slide the hood H2 on the cable, the extruded end of the hood under the shield braid. Place the receptacle J3 in the hole on the rear of the chassis below the fuse post, the threaded end inserted through the hole from the inside of the chassis. If necessary, secure the receptacle temporarily using 3/16" 4-40 screws. Heat the solder lug of J3 and melt the solder, push the tinned end of the cable G2 into the lug and remove the iron immediately. Slide the hood down the cable to the chassis, fasten hood and receptacle with two 3/16" 4-40 screws, shakeproof washers and nuts. Slide the shield braid down over the hood and solder. Solder the braid a little at a time so that the hood and braid can cool down and the insulation will not be melted.

b. Strip three inches of the vinylite covering of the cable G2 from the other end. Cut the now exposed shield back 3/4" from the end being careful not to damage the insulation underneath. Solder a piece of the W2 hookup wire to the shield braid at the point where the outer covering was cut. Lay the cable G2 along the edge of the

chassis near the crystal socket X15 and solder the W2 wire to the ground terminal under the mounting nut of socket X6. Strip the insulation on the center conductor of G2 back about a quarter inch and solder to lug 12 of the crystal selector switch SW8. Looking at the switch from the rear and calling the rotor lug #1, this is the 12th lug in a clockwise direction. Carefully tin the end of the shield with solder being careful not to melt the insulation.

33. a. Connect C40, .005 mfd. 450 volt mica condenser between pin 1 and pin 5 of the 4D32 socket X7. Run the lead at pin 5 also thru one of the solder terminals mounted there and solder at the terminal and pin 5 only. Do not solder at pin 1 as yet.

b. Using 1/4" 6-22 binding head screws, fasten 1" of the W2 hookup wire stripped on each end of the condenser C28 (.002, 1200 WV mica). With the wire leads toward the chassis run these leads thru the lugs on pin 2 of X7, pin 4 of X7 and thru the solder terminal beside pin 4. Draw the condenser down tightly and solder at all points.

34. a. Place resistor R27, 2000 ohms, 1 watt and R24, 2700 ohms, 1 watt, on the chassis beside terminal board X21 and connect both between each of the end terminals of X21. Do not solder.

b. Connect shunt SH4, 1/2 watt, 5 ohms between the front terminal of X21 and the fifth terminal from the front of the chassis on X21. SH4 should be on the same side of X21 as R27. Do not solder.

c. On the same side of X21, connect R17, 2700 ohms, 1 watt resistor between the third and fifth terminals from the front of the chassis on terminal board X21. Use the excess length of the lead of R17 connected to the fifth terminal to also connect to the fourth terminal from the front. Do not solder.

d. On the other side of X21, connect R15, 1500 ohms, 1 watt resistor between the second terminal from the front of the chassis on X21 and the ground soldering terminal under the mounting nut of X21 toward the front of the chassis. Solder the ground terminal.

e. On the same side of X21, between the second and third terminals from the front of the chassis on X21, connect R16, 820 ohms, 1 watt. Do not solder.

f. Between the terminal of terminal board X21 nearest the front of the chassis and pin 7 of the 4D32 socket X7 connect C39, .005 mfd. 150 volt mica condenser and solder.

g. Between the rearmost terminal of X21 and pin 6 of the 4D32 socket X7 solder the RF choke L6 (102-750). It will be necessary to attach a short length of W2 wire stripped to make the choke reach between these terminals.

h. Solder the connections on terminal board X21.

35. The modulation transformer has dual secondary windings, normally series connected by instructions b, c, and d immediately following. If 500 ohm unbalanced audio output is desired, as for driving a power amplifier, substitute b,c, and d in the box below for parallel secondary connection.

a. Mount the modulation transformer T4 (SNC P1992) atop the chassis between the meter switch SW7 and the 807 sockets X3 and X4, as shown in Figure 9, using 3/8" 8-32 screws, shakeproof washers and nuts.

b. Cut both the green/yellow and the red wire to length and solder to the left hand terminal of X18.

c. Trim the yellow wire of T4 to length and connect to the second termial from the left on X18. Do not solder.

d. Cut to length both the red/yellow and green wires of T4 and solder to the center terminal of X18.

For 500 ohm audio output only.

b. Cut the red wire to length and solder to the left hand terminal of X18 and also the next terminal on the right.

c. Cut both yellow and the green leads to length and solder to the center terminal of X18.

d. Trim the red/yellow and green/yellow leads to length and solder to the ground terminal on the right mounting screw of X18.

The 500 ohm output can now be obtained between the center terminal of X18 and ground. The only other change required is shown in 44 r.

e. Install a grommet 22.113-1 in the hole between the 807 sockets X3 and X4. Run the brown and blue transformer leads thru the grommet to the top of the chassis.

36. a. Mount the high voltage transformer T1 (SNC P1781) in the corner of the

chassis between the 807 sockets and the 5R4 sockets X8 and X9 using 3/8" 8-32 screws.

b. Trim the black leads of T1 to length and solder one lead to each of the two rearmost terminals of terminal board X22.

c. Solder the red-yellow lead of T1 to the second terminal from the front of the chassis on terminal board X22.

d. Connect one of the red leads of T1 to pin 4 of the 5R4 socket X8. Do not solder.

e. Connect one of the red leads of T1 to pin #6 of the 5R4 socket X9.

f. Using W2 hookup wire connect sockets X8 and X9 in parallel as follows:

Pin 6 of X8 to pin 6 of X9 and solder.

Pin 4 of X8 to pin 4 of X9 and solder.

Pin 2 of X8 to pin 2 of X9 and solder only at X9.

Pin 8 of X8 to pin 8 of X9 and solder only at X8.

g. To make a neat job the leads of T1 may be now laced up with lock-stitch (waxed linen string).

37. -Before mounting the choke L1 (SNC P1783) between the 5R4 sockets X8 and X9 and the 5Z4 socket X10, note that there is a small hole in the chassis inside the square formed by the mounting holes of the choke. Insert a 1/4" 6-32 screw into this hole from the top of the chassis and fasten loosely with a nut.

a. Mount the choke L1 atop the chassis using 3/8" 8-32 screws, shake-proof washers and nuts. See Figure 9.

b. Connect one of the leads of the choke to pin 1 of socket X9. Do not solder.

c. Connect the other choke lead to pin 8 of socket X9 and solder.

38. a. Mount the filter choke L3 (SNC P1784) under the chassis in front of

the fuse post, the choke parallel to the rear edge of the chassis. Secure only the end of the choke nearest the right hand end of the chassis using a 1/4" 6-32 binding head screw, shakeproof washer and nut.

39. a. Mount the transformer T2 (SNC P1782) atop the chassis on the rear right hand corner as seen in Figure 9, using 3/8" 8-32 screws, shakeproof washers and nuts. Secure the loose end of L3 at the same time. The red leads of the transformer should project thru the 5/8" hole in the chassis nearest the corner. Allow some slack in all the leads of T2 so that they may be later cabled.

b. Solder one red lead of T2 to pin 4 of the 5Z4 socket X10.

c. Solder the other red lead of T2 to pin 6 of X10.

d. Solder one of the brown leads of T2 to pin 2 of X10.

e. Solder the other brown lead of T2 to pin 8 of X10.

f. Leave the green leads of T2 their full length and solder one to pin 1 of the 4D32 socket X7, the other to pin 7.

g. Solder one of the blue leads of T2 to pin 1 of the 6AL5 socket X11.

h. Solder the other blue lead of T2 to pin 5 of X11.

i. Solder one of the yellow wires of T2 to pin 8 of the 5R4 socket X8.

j. Solder the other yellow wire of T2 to pin 2 of X8.

k. For the sake of neatness lace these transformer leads to the main wiring harness from T2 to the 5R4 sockets X8, X9 leaving the black wires and the red-yellow wire out of the cable opposite terminal board X17 and the green wires out opposite pin 1 of socket X7.

l. Solder the red-yellow lead of T2 to the ground lug under the mounting nut of X17 nearest the top of the chassis.

m. Connect one of the black leads of T2 to the center terminal of terminal

chassis between the 807 sockets and the 5R4 sockets X8 and X9 using 3/8" 8-32 screws.

b. Trim the black leads of TI to length and solder one lead to each of the two rearmost terminals of terminal board X22.

c. Solder the red-yellow lead of TI to the second terminal from the front of the chassis on terminal board X22.

d. Connect one of the red leads of TI to pin 4 of the 5R4 socket X8. Do not solder.

e. Connect one of the red leads of TI to pin #6 of the 5R4 socket X9.

f. Using W2 hookup wire connect sockets X8 and X9 in parallel as follows:

Pin 6 of X8 to pin 6 of X9 and solder.

Pin 4 of X8 to pin 4 of X9 and solder.

Pin 2 of X8 to pin 2 of X9 and solder only at X9.

Pin 8 of X8 to pin 8 of X9 and solder only at X8.

g. To make a neat job the leads of TI may be now laced up with lock-stitch (waxed linen string).

37. -Before mounting the choke LI (SNC P1783) between the 5R4 sockets X8 and X9 and the 5Z4 socket X10, note that there is a small hole in the chassis inside the square formed by the mounting holes of the choke. Insert a 1/4" 6-32 screw into this hole from the top of the chassis and fasten loosely with a nut.

a. Mount the choke LI atop the chassis using 3/8" 8-32 screws, shake-proof washers and nuts. See Figure 9.

b. Connect one of the leads of the choke to pin 1 of socket X9. Do not solder.

c. Connect the other choke lead to pin 8 of socket X9 and solder.

38. a. Mount the filter choke L3 (SNC P1784) under the chassis in front of

the fuse post, the choke parallel to the rear edge of the chassis. Secure only the end of the choke nearest the right hand end of the chassis using a 1/4" 6-32 binding head screw, shakeproof washer and nut.

39. a. Mount the transformer T2 (SNC P1782) atop the chassis on the rear right hand corner as seen in Figure 9, using 3/8" 8-32 screws, shakeproof washers and nuts. Secure the loose end of L3 at the same time. The red leads of the transformer should project thru the 5/8" hole in the chassis nearest the corner. Allow some slack in all the leads of T2 so that they may be later cabled.

b. Solder one red lead of T2 to pin 4 of the 5Z4 socket X10.

c. Solder the other red lead of T2 to pin 6 of X10.

d. Solder one of the brown leads of T2 to pin 2 of X10.

e. Solder the other brown lead of T2 to pin 8 of X10.

f. Leave the green leads of T2 their full length and solder one to pin 1 of the 4D32 socket X7, the other to pin 7.

g. Solder one of the blue leads of T2 to pin 1 of the 6AL5 socket X11.

h. Solder the other blue lead of T2 to pin 5 of X11.

i. Solder one of the yellow wires of T2 to pin 8 of the 5R4 socket X8.

j. Solder the other yellow wire of T2 to pin 2 of X8.

k. For the sake of neatness lace these transformer leads to the main wiring harness from T2 to the 5R4 sockets X8, X9 leaving the black wires and the red-yellow wire out of the cable opposite terminal board X17 and the green wires out opposite pin 1 of socket X7.

l. Solder the red-yellow lead of T2 to the ground lug under the mounting nut of X17 nearest the top of the chassis.

m. Connect one of the black leads of T2 to the center terminal of terminal

board X17. Do not solder.

n. Connect the other black lead of T2 to the top lug of X17 to which a blue-Orange lead was previously connected, solder.

o. Install a grommet 22-311-1 in the hole beside the terminal board X17, insert the power cord leads, tie an overhand knot in the cord inside the chassis and solder the leads, one to the center terminal of X17, the other to the body terminal of the fuse post.

40. a. Install a #10 solder terminal under the mounting nut of the choke L1 nearest the center of the chassis.

b. Connect the lead previously soldered to pin 3 of socket X11 to this lug. Do not solder.

c. Solder a piece of #2 wire between pin 7 of VFO socket X12 and pin 4 of 6AL5 socket X11.

d. Connect one of the leads of choke L3 to pins 2 and 7 both of socket X11. Solder at pin 2 only.

e. Fasten a #10 soldering lug under the front mounting nut of the variable inductor L9 and solder the black wire which comes out of the harness very close to this point.

41. a. Solder shunt SH2 between the front terminal and the second terminal from the front on terminal board X22, as seen in Figure 10.

b. Solder shunt SH1 between the second and third terminals from the front of terminal board X22.

42. a. Trim the RG8U lead G1 to exactly 11 inches long. Strip the insulation off the outside of one end for one inch. Trim 1-1/4" of insulation off the other end, unbraid the shield on this end.

b. Cut the center insulation back to 1/4" of the point where the outside insulation was cut on the 1-1/4" length.

c. Fasten a #10 solder terminal under the rear bottom stator connection on the output coupling condenser C30.

d. Fasten another #10 soldering terminal under the screw on C30 under which was previously fastened a soldering lug for connecting together the rotors of C30 and C29.

e. Trim the center conductor to the RG8U to length, fit it in the lug on C30's stator and solder.

f. Divide the strands of the outer braid, gather about half on the proper side of the cable, twist them together into a lead and solder to the solder terminal on the rotor of C30. Trim off the other strands of the braid which are left.

43. a. At the other end of the RG8U cable, slide the braid back on the cable, trim the insulation of the center conductor back about 1-1/4", tin the end of the wire.

b. Slide the hood H1 (83-1H Amphenol) onto the RG8U cable.

c. Force the receptacle J4 (83-1R) into the hole on the rear edge of the chassis under L1 from inside the chassis, the solder terminal extending into the chassis.

d. Fill the solder terminal with solder.

e. Pushing the hood back out of the way, solder the center conductor of the RG8U to the solder terminal of J4.

f. Fasten the receptacle and hood to the chassis using 3/16" 4-40 screws, shakeproof washers and nuts.

g. Slip the braid of the RG8U down over the hood, solder carefully and trim off the excess braid. Be sure to check and make sure that none of the braid wires are left inside the hood.

44. a. Mount the audio gain control R6 (1/2 meg. volume control) on the front

edge of the chassis under the meter switch. Discard any washers furnished with the control.

b. Using W2 wire solder the center lug of R6 to the #1 pin of the 6AU6 socket X2.

c. Looking at the back of R6, the lug in a counter-clockwise direction from the center lug should be connected to pin 2 of X2 with W2 wire. Solder at control only.

d. Solder R7, 220 ohms, 1/2 watt to pin 2 of X2, connect other end of R7 to pin 7. Do not solder.

e. Connect C1, 10 mfd. 25 V tubular electrolytic between pin 7 of socket X1 and the rear terminal of X19 and solder at X19.

f. Connect C4 .1 mfd. tubular condenser between the end terminals of terminal board X19. Do not solder.

g. Solder the ground lead at the rear nut of terminal board X19.

h. Connect R5, 25,000 ohms, 1/2 watt resistor between the center terminal of terminal board X19 and the front terminal. Do not solder.

i. Connect R4, 250,000 ohms, 1 watt between the front terminal of X19 and pin 5 of socket X1. Do no solder.

j. Connect R3, 470,000 ohms, 1/2 watt between the front terminal of X19 and pin 6 of socket X1. Solder at X19 only.

k. Connect R8, 50,000 ohms, 1/2 or 1 watt resistor between pin 6 of socket X2 and the center terminal of terminal board X19. Do not solder.

l. Connect the modulator screen by-pass condenser C8, .5 mfd. 600 volts between pin 5 of socket X3 and pin 2 of socket X4 and solder. C8

should lie parallel to the rear of the chassis and behind sockets X3 and X4, instead of the position shown in figures 8 and 10.

m. Solder C3, .02 mfd. 600 V tubular to pin 6 of socket X1. Connect the other end to the rear terminal on X19. Do not solder.

n. Connect C6, .02 mfd. 600 V tubular between pin 6 of socket X2 and the rear terminal of X19. Solder at pin 6 only.

o. Solder R2, 2,000 ohms, 1/2 watt between pins 4 and 7 of socket X1.

p. Looking at the rear of the volume control R6 solder to the first terminal clockwise from the center terminal C2, .003 mfd. 600 V tubular condenser. Solder the other lead of C2 to pin 5 of Socket X1.

q. Solder one end of C5, .01 mfd. 1000 volts moulded or paper tubular condenser to pin 7 of socket X2. Connect the other end to the right hand terminal of board X18. Do not solder.

r. Solder R9, 1 watt 250k ohm resistor between the right hand terminal of X18 and the X18 terminal second from the left. See Operation 35

When the Modulation transformer has been wired for 500 ohm output, R9 should be changed to 120k ohm 1 watt. It is connected between the right hand and center terminals of X18, not as described previously.

Check to make sure all the joints are soldered in the audio section.

45. a. Mount the bias supply filter condenser C12 and C13 (dual, 16 mfd. 150 volt electrolytic) parallel to the rear edge of the chassis between socket X11 and resistor R13 with the red and green leads to the left.

b. Connect the positive leads of C12 and C13, red and green, to the ground lug near one end of the condensers. See Figure 8.

c. Connect one of the negative leads (blue) of this dual condenser to pin 7 of socket X11 and solder.

d. Solder both the white lead 21A, the other negative lead of the dual condenser (black) and the remaining lead of the choke L3 to pin 6 of socket X11.

46. a. Mount the dual capacitor C10-C11 (dual 16 mfd. 450 volts) parallel to the rear edge of the chassis on the screw located beneath the choke L1, the negative (black) lead toward terminal board X22.

b. Solder the negative (black) lead to the solder lug located under the rear mounting nut of terminal board X22.

c. Mount choke L2 (SNC P1501) on the rear edge of the chassis with the leads down, directly under L1 using 3/8" 8-32 screws, shakeproof washers and nuts.

d. Solder one of the positive leads of C10-C11 and one of the leads of choke L2 to pin 3 of socket X10.

e. Solder the other lead of L2 and the other positive lead of C10-C11 to pin 8 of socket X10.

47. a. Mount the audio transformer T3 (SNC P1503) underneath the chassis on the left end above the terminal board X18, with the red and blue leads up. Use 1/4" 6-32 binding head screws, shakeproof washers and nuts.

b. Solder the yellow lead of T3 to pin 3 of socket X3.

c. Solder the green wire of T3 to pin 3 of socket X4.

d. Solder the black lead of T3 to the 4th terminal from the left end of terminal board X18.

e. Solder the red lead of T3 to the center terminal of terminal board X19.

f. Solder the blue lead of T3 to the plate pin 5 of socket X2.

48. a. Mount the high voltage filter condenser C9, 10 mfd. oil-filled on the rear edge of the chassis between the left end of the chassis and the Amphenol output socket. Use 3/4" 8-32 screws, shakeproof washers and nuts. Mount the brackets so that there is as much clearance as possible between the condenser and the wiring below. The screw nearest the receptacle J3 should have the nut outside the chassis so it can be

used for a ground terminal.

b. Using W2 wire, solder a lead from one terminal of C9 to the #1 pin of socket X9.

c. Also using W2 wire, solder a lead between the other terminal of C9 and the second terminal from the front of terminal board X22.

49. Solder plate caps TC2 and TC3, one on each of the modulation transformer leads previously run thru a grommet to the top of the chassis.

50. a. Using the shielded wire, W5, temporarily connect the microphone input connector J1 (PC1M Amphenol).

b. Solder the center conductor to the center contact of J1, wrap a short piece of W2 wire, stripped, around the shielding of the wire W5 and solder. Solder the other end of the wire to the ground lug on the connector. Cut 1" off the other end of W5 for use in 50 d.

c. Wrap another short piece of stripped W2 wire around the shield braid of the other end of the shielded wire and connect to pin 2 of socket X1.

d. Slip a half-inch piece of spaghetti over one lead of the resistor R1 1 meg. 1/2 watt. Slip a one inch length of shield braid only over the entire resistor for shielding. Tin the ends of the braid at the end of the resistor where it is insulated with spaghetti. Solder the braid to the other lead of the resistor.

e. Solder the center conductor of the shielded wire and the insulated end of the resistor R1, 1 meg. 1/2 watt to pin 1 of socket X1.

f. Solder the other end of R1 to pin 2 of socket X1.

g. Secure a #10 solder lug under the most convenient nut on the chassis near pin 4 of the 4D32 socket X7 and solder X7's #14 ground lead to this lug.

51. a. We are now at the stage where the testing should be done. The panel should not be mounted nor the transmitter placed in the cabinet until after testing thouroughly. First look over the wiring carefully for

unsoldered joints, accidental grounds and other mechanical difficulties.

b. Loosen the tap on the high voltage divider R13 and adjust the position to approximately 1/3 of the distance from the end nearest the center of the chassis.

c. Next with all the tubes out of their sockets, plug in the power cord, throw the low voltage switch and check to determine that line voltage is applied to the primary (black) leads of the low voltage transformer T2.

d. If no trouble is encountered at this stage, throw the high voltage switch and check to see if line voltage is applied to the high voltage transformer T1.

e. Next plug in the 5Z4 rectifier in socket X10 and check the voltage between ground and the fourth terminal from the front of the chassis on terminal board X20. This voltage should be approximately 380 volts positive with reference to ground, with the line voltage approximately 120 volts.

f. Plug the 6AL5 in the socket X11. This should produce a voltage approximately 85 volts negative with respect to the chassis on the front terminal of terminal board X21. Voltage at the second terminal from the front of the terminal board X21 should be approximately 28 volts. Voltage at the third terminal from the front should be around 43 volts. These readings taken with a 20,000 ohms per volt meter will be less on a 1,000 ohm per volt meter. Connect the panel meter temporarily to its leads.

g. Set the phone/CW switch on CW. Next plug in the 6AU6 oscillator tube into socket X6 and switch the meter to the "osc" position. Oscillator

current without a crystal will run approximately 14 ma. With an active 160, 80 or 40 meter crystal plugged into the crystal socket this current will drop to around 7 ma. The meter reads 25 ma. full scale on the oscillator position.

h. Next plug the 6AQ5 buffer into socket X5, set the bandswitch to correspond with the output frequency desired. Turn the excitation control R25 up about half way. With the meter switch in the "buffer" position, tune the oscillator condenser C18 to the position where the 6AQ5 ("buffer") plate current rises. Tune C18 for maximum "buffer" plate current. This rise in plate current indicates that the 6AQ5 is receiving excitation.

i. Do not yet apply high voltage. Next plug in the 4D32 amplifier and connect the plate cap.

j. Turn the meter switch to the "grid" position. The meter may now show some deflection indicating grid current flowing in the 4D32. The meter reads 25 ma. at full scale in the "grid" position and the maximum permissable grid current on the 4D32 is 15 ma. or 60% of full scale. Avoid exceeding this value. The amount of excitation which can be obtained will vary over the various bands, however enough excitation to drive the amplifier to full output over its entire range can be obtained even though the maximum of 15 ma. is not necessarily available. Although the loading of the final amplifier will cause the grid current to decrease, in general the following is the amount of excitation available under different operating conditions. with reasonably active crystals.

Xtal Freq.	Output Freq.	Grid Current
1800-2000	1800-2000	15 ma. plus

	Xtal Freq.	Output Freq.	Grid Current
	1800-2000	3600-4000	15 ma. plus
	1800-1825	7000-7300	13 ma. - note 1
	1750-1800	14000-14400	13 ma. - note 2
	3500-4000	3500-4000	15 ma. plus
	3500-3650	7000-7300	15 ma. plus
	3500-3600	14000-14400	15 ma. - note 3
	3500-3712.5	28000-29700	8 ma. - note 4
	7000-7300	7000-7300	15 ma. plus
	7000-7200	14000-14400	15 plus
	7000-7425	28000-29700	15 plus
	7000-	21000	15 plus
(14 mc. xtals)	4666-4800	14000-14400	15.
	4866-4950	28000-29700	10

Note 1: This type operation is not recommended as it is possible to obtain output also from 5400 kcs. to 5475 kcs.

Note 2: It is possible to accidentally get output around 10.8 mcs and 11.6 mcs.

Note 3: It is possible to get output around 10.8 mcs.

Note 4: It is possible to get output around 24.5 mcs.

k. Re-tune the oscillator and buffer tuning condensers for maximum 4D32 grid current keeping this value to 15 ma. or below by turning the excitation control back.

l. Next plug the 5R4 rectifiers into sockets X8 and X9 and with the excitation control turned to zero, throw the high voltage switch on. The voltage from the lug of the voltage divider nearest to the center of the chassis should be approximately 700 volts positive above the

chassis. Keep the 807 plate caps away from ground. Don't touch them! They have full plate voltage on them.

m. Turn the excitation control up until the 4D32 draws about 150 ma. plate current (read on the "plt" position of the meter switch).

n. Tune the final amplifier to resonance starting with the tuning condenser C29 at maximum capacity. This precludes the possibility of tuning the final amplifier to a harmonic. Resonance is the point where the current dips sharply.

o. Attach the antenna to the output terminal and re-turn the amplifier to resonance. Minimum coupling is with C30 turned counterclockwise to full capacity and the coarse coupling switch set counterclockwise with all the capacitors in the circuit. The amplifier should be tuned to resonance with minimum coupling and then loaded by adjusting the coarse coupling switch and C30 bringing the amplifier back to resonance each time with C29. The antenna should be loaded until the final amplifier plate current dips only about 10% as the amplifier is tuned thru resonance. The grid current should now be brought up to its normal value (10 to 12 ma.) and the plate current will be around 275-300 ma. Turn off the high voltage! Antennas requiring balanced transmission line currents M2X may be loaded by means of an external balanced tank circuit link coupled to the transmitter.

p. Next plug in the 6AU6 amplifier tubes into sockets X1 and X2. Plug the 807's into the socket X3 and X4 and attach the plate caps.

q. With the audio gain control turned to the off position and the phone/CW switch in the phone position, throw the high voltage on. If a whistle

is heard from the modulation transformer, turn the high voltage off and reverse the 807 plate caps.

r. The tap on the voltage divider R13 should now be adjusted in the "phone" position with the final drawing normal plate current the voltage at the tap is between 310 and 350 volts. Adjust the tap so that the no signal modulator plate current reads between 70 and 80 ma. Don't try and adjust the tap with the plate voltage on! Loosen the tap sufficiently so that the resistance wire is not damaged as the tap is moved.

s. Attach your microphone to the mike input connector and adjust the audio gain control for 100% modulation.

52. a. While the transmitter is still out of its cabinet and the front panel is still unattached, it is a good plan to check the operation of the transmitter on all bands to be certain oscillator and buffer stages are wired correctly.

53. After thoroughly testing the transmitter, mount the panel on the chassis as follows:

a. Unsolder the microphone connector J1 at the connector.

b. Mount the meter M1 in the panel using the screws and washers furnished with it.

c. Mount the final tuning index plate and escutcheon assembly D2 (23.906-1). The maroon escutcheon goes over the rectangular hole in the center of the panel, the index plate behind the panel with the indicating mark up. The spacers should be between the panel and the plate. Mount with the screws, washers and nuts furnished.

d. Mount the microphone connector on the panel with the smooth washer between the connector and the front of the panel. Discard the insulating washers. Secure to the panel with the nut furnished on J1.

e. Solder two of the flat #10 solder lugs, one to each of the meter leads.

f. Mount the jewels X13B and X14B in their proper places on the panel, with the green jewel toward the left of the panel, and secure with the nuts furnished.

f$_1$ Mount a panel bearing D17 on the front panel in the hole corresponding to the drive shaft of the final amplifier tuning dial. The threaded portion of the panel bearing should be toward the chassis.

g. Slip the final tuning dial D1 (23.906-1) on the shaft of the condenser C29, the hub toward the rear of the transmitter. It should be as far back as possible and it is not yet necessary to tighten it.

h. Check the front of the chassis to make sure that all the bearings required are properly installed and that all shafts and shaft couplers are in their correct positions and tight.

i. Tentatively place the panel over the shafts of the transmitter, shifting shafts as necessary to get them to pass thru the panel holes.

j. Note which, if any, of the panel bearings or mounted bushings of switches or other components keep the panel from slipping down over the threads. If necessary, loosen the nuts which are causing the trouble and shift the positions of the components slightly.

k. Make a very careful check to see that all the jobs which cannot be done after the panel is in place are taken care of. Put the panel in position and fasten by means of the 3/32" thick 3/8 x 32 nuts with the exception of the toggle switches. Be most careful not to mar the panel with pliers.

l. Fasten the knurled nuts on the toggle switches with your fingers. By grasping the knurled nut of the switch and at the same time the body of the switch and moving both the nut and switch slightly, the nut may be tighten without tools.

m. Mount the ground lug on J1 using one of the 3/8" - 32 nuts. Don't tighten this nut excessively since the threads will strip easily at this point.

n. Re-solder the input leads to J1.

o. Connect the meter leads by means of the nuts on the meter terminal studs being careful to observe correct polarity.

p. Set the main dial to zero with the condenser C29 at full capacity and tighten.

q. Attach the knobs to the shafts per the following. If, as the knobs are secured, they are tightened as tightly as possible, loosened and re-tightened they will be anchored solidly and will not turn on the shaft.

Oscillator - 0-100 over 180 degrees zero on dial at full capacity of condenser.
Bandswitch - With switch at extreme counter-clockwise position dial reads "160".
Drive - With excitation control at extreme counter-clockwise position dial set at zero.
Main Tuning -Spinner dial no orientation required.

Coarse Coupling - Dial marked 1 to 7, dial on position 1 with switch in counter-clockwise position.
Fine Coupling - Dial 0-100 at zero position with full capacity.

Meter - With meter switch in counter-clockwise position, dial reads "Off".
Oscillator - 0-10 dial at zero with switch in counter-clockwise position.
CW - Phone - Dial has single mark at CW position with switch at counter-clockwise position.
160-Out-In - Dial has single mark at "Out" position with switch at counter-clockwise position.
Audio - With control at counter-clockwise position 0-10 dial at "0" position.

r. Slide the transmitter into the cabinet being careful to support the chassis at the rear to avoid scratching the bottom of the cabinet. Lift the front panel slightly to keep it from marring the front bottom edge of the cabinet. Secure the chassis by means of the 3/8" self-tapping screws run through the bottom of the cabinet.

s. Secure the panel to the cabinet using cup washers and oval head 10-32 screws.

TUNING INSTRUCTIONS

General: In initially tuning the transmitter you will find the tuning curves (last two pages of the book) useful in determining the mode of operation of the exciter. For instance, on 160 meters (1.8 - 2.0 mcs.), 80 meters (3.5 mcs. - 4.0 mcs.), 40 meters (7.0-7.3 mcs.) the plate circuit of the oscillator and the plate circuit of the buffer are both tuned to the output frequency. This is true in all cases no matter whether the crystal is ground to 160, 80 or 40 meters or with VFO excitation. When delivering 20 meter output (14.0 - 14.4 mcs.) the 6AQ5 buffer is tuned to the output frequency but the plate circuit of the oscillator is tuned to some lower frequency. If 40 meter crystals within the range of 7.0 - 7.2 mcs. are used for 20 meter output the oscillator plate circuit is also tuned to the range of from 7.0 to 7.2 mcs. The same thing is true when using crystals within the range of 3.5 - 3.6 mcs. (80 meters). While 160 meter crystals of the correct frequency (1.75 - 1.8 mcs.) will drive the transmitter satisfactorily on the 20 meter band, their use is not recommended. It is possible to accidentally obtain output of 10.5 - 10.8 mcs. and 12.25 - 12.6 mcs. Third harmonic 20 meter crystals whose fundamental frequencies lie between 4.6 and 4.8 mcs. may also be used for 20 meter output. With these crystals the plate circuit of the oscillator is tuned to the crystal's fundamental frequency. On 10 meters (28.0 - 30 mcs.) the 6AQ5 buffer is also tuned to the output frequency and the oscillator plate circuit is tuned to half this frequency. This will permit use of both 40 meter and 20 meter crystals for 10 meter output. Theoretically it would be possible to use 10 meter crystals and 80 meter crystals for 10 meter output but in practice is not satisfactory. Ten meter crystals do not produce enough drive and with 80 meter crystals (3.5 - 3.77 mcs.) there is the possibility of obtaining output from 21.0 - 22.62 mcs., from 24.5 - 26.39 mcs. and at 31.5 mcs.

Tuning should be done in the CW position. Oscillator and buffer stages have plate voltage and may be tuned without having the 4D32 supply switched on. The excitation control (labelled "drive") provides a convenient means of limiting drive to the 4D32 grid. Since the final amplifier is supplied with cutoff bias, amplifier plate current can be set at any desired value by adjusting grid current. Both excessive grid current and excessive "out of resonance" plate current can be avoided thus prolonging tube life. Maximum grid current to the 4D32 is 15 ma. If grid current is kept at 10 ma. there is no appreciable difference in efficiency and considerably less effect from contamination of the grid by cathode material.

There is some variation in characteristics among 4D32's and the optional resistor R24 shown in dashed lines on the schematic in the grid circuit of the 4D32 is to compensate for this variation. Grid bias of the 4D32 with key down, normal drive and normal loading should run between 90 and 110 volts. If the bias is more than this, install R24.

The maximum permissable loaded plate current for the 4D32 tube is 300 ma. For most efficient performance and long tube life, 4D32 plate current should be kept between 250 and 275 ma.

160 MTRS (1809 NET FREQ) drive — 4
AUDIO — 4
FINAL — 0
FINE COUPLING — 80
ANTENNA CONDENSER — 160
NOTE — if final current not OK adjust FINE COUPLING

Detailed Tuning: Assume that the Viking I transmitter is to be tuned up for output in the 40 meter band (7.0 - 7.3 mcs.) using a crystal within the same range. The chassis should be connected to an effective ground, the antenna connected to the output terminal located near the center of the rear of the chassis. Place all the tubes in their respective sockets and connect the plate caps to the 807's and the 4D32. Install the crystal in position #1 of socket X15.

Set the exciter bandswitch (marked "band") to the "40" position. Turn the "drive control counterclockwise to ~~zero.~~ 3. Set the main tuning dial to zero. ~~Turn the coarse coupling control (marked "coupling") to position #1.~~ Turn "fine coupling" control to ~~zero~~ 100 (C30 at full capacity). ~~Meter switch should be on "ose". Crystal switch should be turned counterclockwise to zero position.~~ Buffer tuning control may be in any position. "CW-Phone" switch should be in "CW" position and "160" meter switch should be in the "Out" position. Audio gain control may be in any position.

a. Throw SW1 "on". This applies all voltages except plate and screen voltages for the 4D32 and the 807 modulators. ~~Oscillator plate current should now rise to about 12 ma.~~

b. Switch crystal switch to ~~position #1.~~ desired XTAL ~~Oscillator plate current should drop perceptibly.~~

c. Switch meter to "buffer" position and advance the "drive" control about 3. ~~1/3 of the way in the clockwise position.~~

d. Rotate the "oscillator" tuning dial slowly until the buffer plate current rises. Adjust the oscillator tuning for maximum buffer plate current.

e. Switch meter to "grid" position and note the grid current. If it should be over 15 ma. reduce it at once by turning the "drive" control in a counter clockwise direction. There probably will be no grid current at this point and if there were it would be because the buffer tuning condenser happened to be at resonance.

f. Tune the buffer condenser for maximum grid current keeping it at 15 ma. or less by means of the drive control. Leave buffer in resonance and reduce grid current to zero by means of the "drive" control.

g. Switch meter to "plt" position and switch ~~SW2~~ MIC. SW. on. Turn "drive" control clockwise until plate current rises to 150 ma.

h. Tune final dial toward 100 until the plate current dips sharply. Be certain that the final is tuned to the <u>first</u> dip in plate current thus assuring that the amplifier is tuned to the fundamental and not to a harmonic.

i. Switch meter back to "grid" position, touch up oscillator and buffer tuning for maximum grid current. Advance "drive" control until grid current is 10 ma. Switch meter back to "plt" position.

j. Proceed to load the antenna by switching coarse coupling switch to position #2 and retune main dial for minimum plate current. If there is not sufficient coupling change coarse coupling switch to position #3 and again retune main dial for minimum plate current. This should be continued until the amplifier current is around 200 ma.

k. Turn the fine coupling control toward 100 until amplifier plate current rises to about 250 ma. Retune main dial for minimum plate current. Follow this procedure until the desired plate current between 250 and 275 ma. has been reached. If after setting the fine coupling control and the desired degree of coupling is not attained, reset fine coupling to zero and tune once again for minimum plate current with the main dial. It will now be necessary to set the coarse coupling switch to the next position toward #3 and retune amplifier as in step j. Now it will be possible to obtain the desired loading with the fine coupling control.

l. For CW operation now simply plug in the key. Check to be sure that amplifier plate current is zero with the key up.

160 Meter Tuning: The crystal should be within the range of 1.8 to 2.0 mcs. Tuning is exactly the same as in the foregoing detailed instructions except that bandswitch (marked "band") should be in the "160" position and the switch marked "In 160 Out" should be turned clockwise to the "In" position. You will find that the oscillator and buffer tuning is quite broad on this band and due to the design of the oscillator there may appear to be more than one oscillator resonance point. This is not a defect and will not affect operation. Oscillator and buffer condensers will be tuned to nearly full capacity at 1.8 mcs. You will find in tuning the main dial that the amplifier resonant point will be quite close to zero on the dial and as you couple the antenna as in steps j. and k. above, the final dial may actually tune to zero and the antenna not yet sufficiently coupled. In this case, leave the main dial tuned to zero and complete amplifier loading by adjustment of the coarse coupling switch and the fine coupling control only. Although you may feel that the amplifier is operating out of resonance, actually the circuit is quite broad on this band and your efficiency will be very nearly as good as on other bands.

80 Meter Tuning: Crystals should be within the range of 1.75-2.0 mcs., 3.5 - 4.0 mcs. Exciter bandswitch should be on the "80" position, the amplifier 160 meter switch (marked "Out 160 In") should be in the counterclockwise position (Out). The detailed instructions above apply. At frequencies near 3.5 mcs. amplifier tuning may prove to be the same as the 160 tuning, when attempting to load very high impedance antennas.

40 Meter Tuning: Use crystals within the following ranges of Frequencies: 1.75 - 1.825 mcs., 3.5 - 3.65 mcs., 7.0 - 7.3 mcs. OR VFO Follow the detailed tuning instructions outlined before.

20 Meter Tuning: Use crystals within the following ranges: 3.5 - 3.6 mcs., 7.0 - 7.2 mcs., 14.0 - 14.4 mcs., (fundamentals 4:67 - 4.8 mcs.). Tuning same as detailed instructions.

15 Meter Tuning: Use crystals within the following ranges of frequencies: 3.5 - 3.575 mcs., 7.0 - 7.15 mcs. Tuning is the same as for other bands. The coarse coupling switch will be set at #7 with all the mica coupling capacitors out of the circuit.

10 Meter Tuning: Use crystals within the following ranges: 7.0 - 7.425 mcs., 6.74 - 6.8 mcs. (11 meters), ~~14.0 - 14.85 mcs., 13.48 - 13.61 mcs. (11 meters).~~ Tuning is the same as for other bands. The coarse coupling switch will be set at position #7. Should you have difficulty in obtaining an indication of grid current when tuning the buffer on 10 meters, switch the high voltage on, set the meter on "plt" and tune the buffer for an indication of amplifier plate current. You will find that this method is very sensitive. After tuning the buffer for maximum amplifier plate current, "touch up" the oscillator tuning. Don't permit the 4D32 to run for any length of time with excessive plate current. As soon as you have sufficient excitation to produce 150 ma. or so plate current, tune the amplifier to resonance (minimum plate current). At 30 mcs. the final dial will be set at or very close to 100. At this frequency the tuning capacity is effectively fixed and tuning is accomplished by varying the inductor which has approximately 1-1/2 turns left in the circuit.

Phone Operation: Tune up the transmitter in the CW position. Turn off the high voltage SW-2. Turn "audio" control counterclockwise to zero. Switch "Phone-CW" to phone position. Switch SW-2 on but if a squeal is heard from the transmitter turn it off immediately. A squeal is indication that the 807 plate leads to the caps should be reversed. Be sure the high voltage is off before doing so! Connect a high impedance crystal or high output dynamic microphone to the connector marked "mic". Switch meter to "mod." position and switch SW-2 on. Talking into microphone advance audio control clockwise until plate current of 807s rises to about 175 ma. on peaks. Antenna current should advance about 20% on modulation.

VFO Operation: A mica insulating capacitor of 50 or 100 mmf. capacity should be installed between the "hot" VFO RF lead and the center contact of the VFO input receptable. If this is not done, in most cases the grid bias of the 6AU6 tube will be short circuited. The amount of drive required by the Viking from a VFO is very slight. Provided the oscillator is stable enough it need have output on two bands only namely 160 meters and 40 meters. With the VFO operating on 160 only 2 volts of RF are required to drive the transmitter to full output on 160 and 80 meters. Six volts of 40 meter VFO output is sufficient to drive the transmitter to full output on 40, 20, 15 and 10 meters. As with crystal controlled operation the VFO's output frequency may be the transmitter's output frequency, 1/2 or 1/4 the transmitter's output frequency. It should be borne in mind that any tendency of the VFO to chirp or drift is increased when the transmitter's output frequency is twice or four times that of the VFO.

Note: The components C7, R11 and R10 shown across the secondary of the driver transformer in the schematic, are optional. Depending upon the type of microphone used and the individual's preference, these parts may be used to still further suppress the high audio frequencies.

Due to variations in line voltage and tolerance of components, bias values may turn out to be different than those shown on figure 12. Values of R15, R16 and R17 may be changed as necessary so long as the current limit of 18 ma. for the 6AL5 is not exceeded.

VIKING I TRANSMITTER

Changes required for use of 829B final amplifier.

1. Turn coupling capacitor C31 down toward chassis to keep plate leads short.

2. Connect another parasitic choke (L11) to C31 by means of a solder terminal.

3. Connect a plate terminal (Johnson 119-848) to each of the parasitic chokes L11.

4. Leave pins 4 and 5 of socket X7 grounded to the chassis but remove the ground lead from pin 7.

5. Remove filament wire from pin 7 and connect filament lead to chassis by means of a solder terminal under a convenient screw.

6. Connect pins 1 and 7 together with #20 wire.

7. Remove the ground lead of the filament bypass condenser C40 and re-connect to ground on the socket mounting screw near pin 1.

8. Remove C28 lead together with screen grid lead from pin 2 and connect to pin 3.

9. Either change screen dropping resistor R28 to 12,500 ohms 20 watts or connect a 3,000 ohm 10 watt resistor in series with R28.

10. Remove condenser C25 and choke L6 from pin 6.

11. Connect a jumper of #14 wire between pins 2 and 6 allowing it to bow upwards 1/2".

12. Re-connect C25 and L6 to the center of the jumper to provide balanced drive to the grids.

Adjustment: With the final amplifier loaded to approximately 230 ma. the voltage divider tap should be adjusted so that screen voltage is approximately 225 volts. This screen voltage setting should provide about 80 ma. no audio signal cathode current on the 807 modulators in the phone position with final amplifier current of 230 ma.

Bias Voltages: Adjustment of bias voltages can be accomplished by changing values of R15, R16, R17 and R25, keeping total current below the 18 ma. limit of the 6AL5.

Viking I Transmitter

Typical operation using 829B final
within ICAS tube ratings.

CW operation with 115 V 60 cycle ac input.

FREQUENCY 28 mc.

P. A. CATHODE CURRENT 230 ma.

SCREEN GRID VOLTAGE 225 volts (loaded)

P. A. PLATE VOLTAGE 660 volts (loaded)

P. A. GRID CURRENT 12 ma.

P. A. GRID BIAS -97 volts

POWER OUTPUT 95 watts

Phone operation with 115 V 60 cycle ac input

FREQUENCY 28 mc.

P. A. CATHODE CURRENT 230 ma.

*SCREEN GRID VOLTAGE 225 volts (loaded)

P. A. PLATE VOLTAGE 620 volts (loaded)

P. A. GRID CURRENT 12 ma.

P. A. BIAS VOLTAGE -97 volts

POWER OUTPUT 87 watts

MODULATOR CATHODE CURRENT 80 ma. (no signal)

*13,000 ohm screen dropping resistor used.

Viking I Pi-Network Tuning and Harmonic Suppression

The pi tuning/coupling network in the Viking I is designed to load the final amplifier into antenna resistances of nominally 50 to 600 ohms throughout its frequency range. In addition it is capable of "tuning out" series antenna reactances up to several hundred ohms to complete a good match to most unbalanced antenna systems. The range of antenna impedances which may be matched by the pi network at frequencies higher than 7.0 mcs. extend from roughly 25 to 2000 ohms.

When the transmitter is well grounded and properly tuned, the harmonic suppression is excellent, generally much better than other conventional methods of antenna coupling. This should be of interest to amateurs afflicted with TVI or other high frequency interference problems.

A. Importance of grounding:

To obtain proper tuning, coupling and harmonic suppression with any transmitter antenna coupling system, the part of the circuit designed to operate at RF ground potential must be at RF ground potential. A "room full of RF" is evidence that a high RF potential exists on something in or near the room. In many cases the source of RF is the transmitter's chassis and power cord. The power cord is very closely coupled to the chassis by the electrostatic shields of the power transformers. This condition is very undesirable for several reasons. Three objectional factors which obviously affect the loading of the transmitter when poor grounds are involved are:

1. The impedance that the output terminal of the transmitter looks into includes not only the true antenna to ground impedance as presented by the antenna feedline but also the transmitter chassis to ground impedance. This additional impedance in some cases will raise the apparent antenna impedance to such a high value that it cannot be loaded by the pi network.

2. Part of the transmitter's power is lost in the ground system due to radiation of the ground lead, power cord or cabinet. This power is quickly dissipated in surrounding objects and contributes nothing to effective radiated power except to distort the antenna's normal field pattern.

3. It is conventional, in designing a transmitter, to bypass harmonics or any possible sources of stray high frequency currents to the chassis on the assumption the chassis will be kept as near ground potential as possible. When a high impedance is presented to these currents at the chassis they are able to radiate to some extent rather than be passed harmlessly to ground.

B. How to obtain a good ground:

What may appear to be a good ground at one frequency may prove to be a poor ground at another. A single ground lead may have "standing waves" on it due to its length. While it may seem difficult to obtain a good ground over

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4. "Load" the antenna feeder by placing an inductor or capacitor in series to cancel out the reactance of the antenna feeder. This may require considerable cut and try and will affect only the reactive component of the antenna impedance. However, it can prove useful in some cases.

5. L type matching networks of inductance and capacitance may be used to aid impedance matching. Much discussion of this more elaborate method of bringing the antenna impedance within the range of the pi network could be included, however, the few cases where it is necessary do not justify inclusion herein. Textbook and handbook discussions will be helpful if work along this line is pursued. There is danger of resonating the coupling condenser of the pi network when using an external coil. This should be watched as excessive voltage built up across the coupling condensers can cause damage. Improper coupling or loading will take place under these conditions.

D. Dangers to be avoided and hints which may further aid in harmonic and TVI reduction.

1. When loading high impedance antennas there is a temptation to "squeeze" the last watt into the antenna by opening the coupling condensers as much as possible. Harmonic suppression is dependent, to a great extent, on the amount of coupling capacity in the circuit. It is wise to use as much coupling capacity as practical at all times. The proper amount of coupling when the antenna impedance is high, can be conveniently determined by holding a neon lamp against the antenna feeder. The coupling condenser can then be opened until little increase in glow is noticed when the coupling condenser and tuning controls are adjusted for maximum output. A decrease in coupling capacitance beyond this point may cause a higher plate current reading due to reduced plate circuit efficiency. Higher harmonic output will also result as the coupling capacity is reduced beyond the point where the output has leveled off. The random antenna system may present a more favorable impedance to harmonic output than the output on the fundamental frequency; hence it is well to use as much coupling capacity as is practical. It is well to remember that the amount of coupling capacitance needed is dependent on the operating frequency. For example, 2,000 micro microfarads at 3.5 mcs. corresponds to 160 micro microfarads at 28.0 mcs.

a wide range of frequencies, it can be done and will be well-worth the trouble when increased radiation efficiency, ease of antenna loading and reduced TVI and BCI are considered. There is also reduced danger of damaging microphones, receivers and other associated equipment with excessive RF fields.

Avoid using the "cold" side of the power line, power line conduit or gas lines for RF grounding. Your good relationship with neighbors and the safety of your family may be jeopardized by RF in the wrong places. Some suggestions which may help to obtain a good ground are:

1. Water pipes or metal building structural members are usually good sources of earth grounds.

2. Use heavy conductors (#14 or larger) between the connection at the ground point and the transmitter. Copper ribbon is excellent for this purpose.

3. The use of several ground leads, each of a different length and selected at random may be helpful in keeping grounding impedance low at the transmitter, even though the transmitter is some distance from a true earth ground. The possibility of obtaining an effective ground at any frequency throughout the transmitter's range is quite good. If at any one frequency, one of the ground leads presents a low impedance at the chassis the chassis is effectively grounded. By changing the length of one of the ground leads experimentally, a good ground can often be obtained at a frequency which has been troublesome. In bringing several leads to the transmitter, small closed loops near the transmitter or antenna feed line should be avoided. Induction fields will tend to raise the impedance of the ground leads.

4. In cases where it is impossible to obtain a good earth ground, connecting the transmitter chassis to some system of conductors having a very low effective impedance to ground compared to the antenna impedance may be helpful. Usually this artificial "ground" takes the form of a system of radial wires spread horizontally on the floor, a gridwork of wires, or a large metal sheet on the floor below the transmitter. To be effective, the minimum area covered by the metal conductors should be roughly equivalent to a square, the length of one side of which approaches a quarter wavelength. This system of "grounding" should be experimented with before committing the location to any permanent installation.

5. A simple counterpoise made up of a single wire attached to the chassis may be helpful. On 10 meters a length of 6 to 8 feet may be attached and the open end cut off 4 inches at a time until the chassis becomes "colder". The open wire may be allowed to drop along the floor although its open end will be somewhat "hot".

6. A rough check on the effectiveness of the transmitter gound may be made by touching the chassis while watching the PA cathode current and grid current with the transmitter operating into its antenna. A change in current upon touching the chassis is indicative of an ineffective ground. If a neon bulb, held between the fingers, can be ignited by touching a contact to the chassis,

the RF present is excessive and is another indication of an ineffective ground. In cases where the transmitter is feeding a low impedance antenna, the test by touching the chassis is more reliable since 50 to 60 volts is required to ignite the neon lamp.

C. Loading Random Antennas with the Pi Network:

With the transmitter chassis well grounded, correctly designed antenna systems having relatively "flat" unbalanced feeder systems, can easily be loaded by following the instructions already given, provided the antennas' terminal impedances fall within the range of the pi network. Feeding a balanced system with a feedline over a quarter of one wavelength long, may prove to be surprisingly successful if the transmitter chassis is held at ground potential. The transmission line between the transmitter and antenna will tend to assume a partial balance at the antenna. Some standing waves will result but may not be excessive. Methods of changing from an unbalanced to balanced transmission system are discussed in the ARRL Radio Amateurs Handbook and devices for accomplishing this change over the amateur bands are beginning to be available commercially.

Antennas having random lengths, random feed points and various types of feed lines will exhibit widely different resistance and reactance characteristics. It is well to remember that the feedline is a very important part of the system. A common example of the random antenna is a horizontal wire fed by a single wire feed line. The feedline in this case actually becomes part of the radiating system. An antenna of this type can, in most instances, be fed by the pi network directly but there are critical dimensions where the antenna series reactance (inducive or capacitive) becomes too high and the antenna resistance can become either too high or too low to be matched by the pi network.

Antennas with high terminal resistance or reactance can usually be recognized while loading the final stage of the Viking I. The final amplifier is normally loaded by reducing the output coupling capacitor (C30) in small steps, retuning the amplifier to resonance each time. This results in an increase in PA cathode current and is continued until full loading is achieved. If however, a point is reached where decreasing the output coupling capacitor (C30) does not result in a marked increase in PA cathode current and the PA is not fully loaded, the antenna can be assumed to have high resistance or reactance at this frequency.

Antennas with low terminal impedance (resistance and reactance both low) can usually be recognized by a noticeable lack of coupling condenser effect in the range of settings normally used at the operating frequency. There will be little or no detuning evidenced as the coupling control is changed.

Several things can be tried in an effort to bring the antenna system into the tuning range of the pi network:

1. Change the length of the feeder line between the antenna and transmitter experimentally 1/8 to 1/4 wavelength.

2. Change the point of connection of the feedline to the antenna 1/8 to 1/4 wavelength.

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1. Change the length of the feeder line between the antenna and transmitter experimentally 1/8 to 1/4 wavelength.

2. Change the point of connection of the feedline to the antenna 1/8 to 1/4 wavelength.

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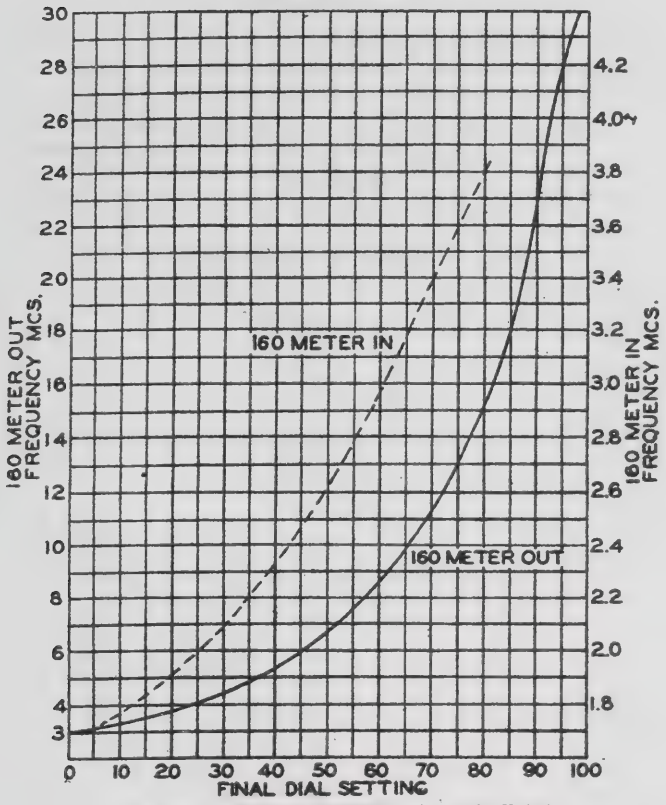
These are the values necessary to couple resistive loads of less than 50 ohms, at the frequencies stated.

2. The low frequency bands (80 and 160 meters) may present the danger of doubling in the final stage when the antenna impedance is high. If the coupling condensers are reduced to values comparable to the capacity of the tuning condenser (C29) the net plate tuning capacity is reduced, as these condensers are effectively in series, and it becomes very possible to inadvertently tune to the second harmonic instead of the fundamental of the intended output frequency. To avoid doubling in the final, the initial tuning should be done with all the output coupling capacity in the circuit and the final tuning control starting from its zero setting. The first dip of the amplifier cathode current as the tuning control is advanced from zero setting, is the resonant point for the fundamental output frequency. As the coupling condensers are reduced the tuning control should be reset, toward zero, for minimum cathode current so that the original plate circuit resonant frequency is maintained. Avoid reducing the coupling condenser values below the point where the output levels off as discussed previously. No danger of doubling in the final will occur if the proper tuning method is followed. For some high impedance coupling conditions on the low frequency end of the 160 meter band, much of the output coupling capacity may be out of the circuit as the antenna is loaded and the tuning control may approach the maximum tank capacity setting (dial zero) and tend to go beyond. The amplifier is quite broad on 160 meters and if, under these conditions, the tuning control is left at zero, the output coupling capacity can be reduced slightly more as more output is indicated by a neon lamp or plate current increase. Even though the amplifier seems to be out of resonance, it will still be resonant, unless the output coupling capacity has been reduced excessively, and the efficiency will be quite good.

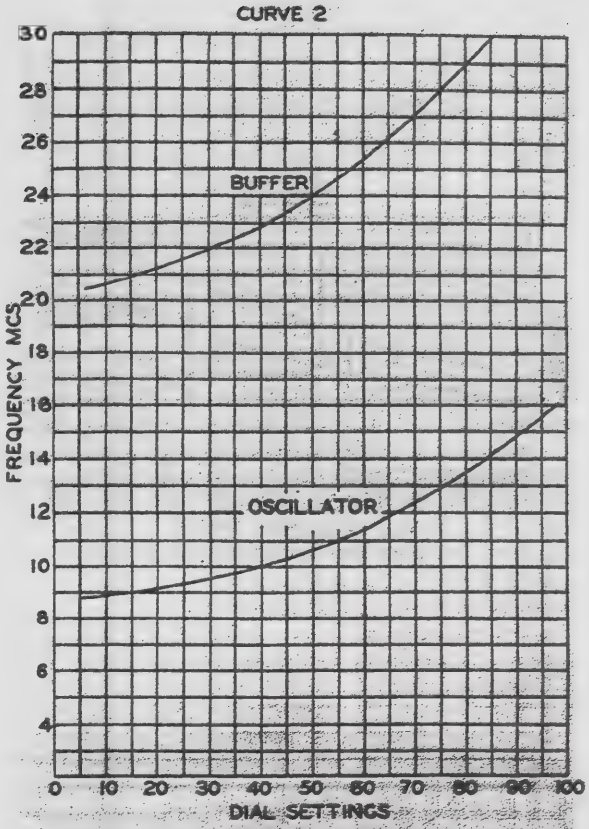
3. If the power line voltage is low or the high voltage rectifiers have low emission, the loaded plate current may not reach the normal value. This condition should not be confused with the inability of the pi network to lead an antenna system.

CURVE 1



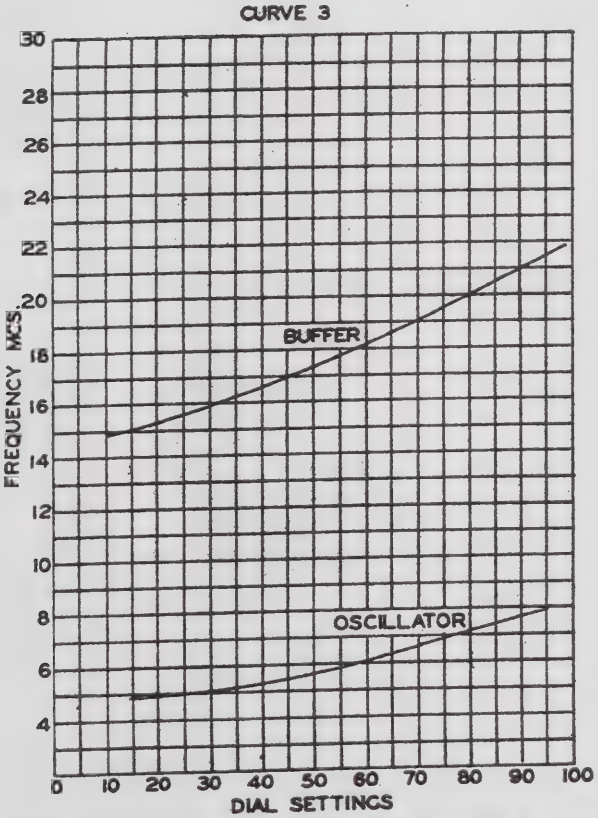
FINAL AMPLIFIER TUNING CALIBRATION
VIKING I TRANSMITTER SERIAL 397
LOADED TO FULL OUTPUT INTO 50 OHMS RESISTANCE

CURVE 2



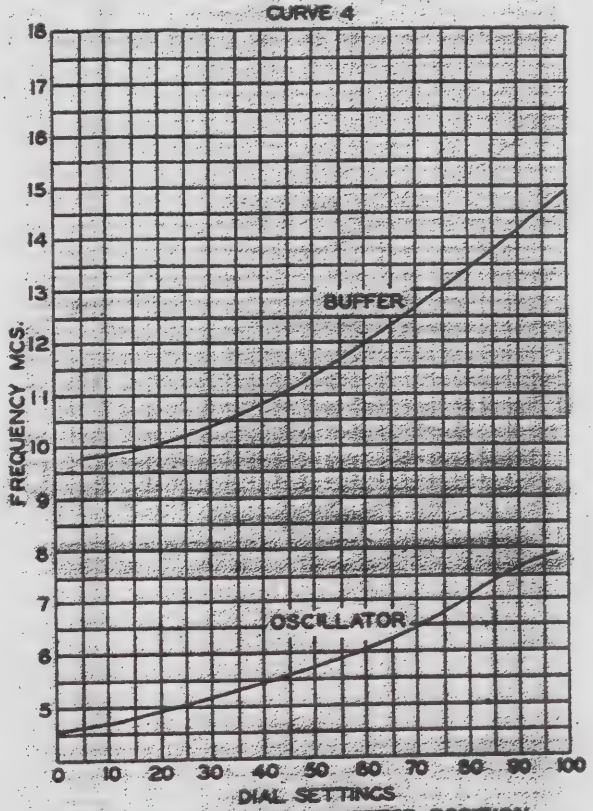
EXCITER CALIBRATION 10 METER BANDSWITCH POSITION VIKING I TRANSMITTER SERIAL 397

CURVE 3



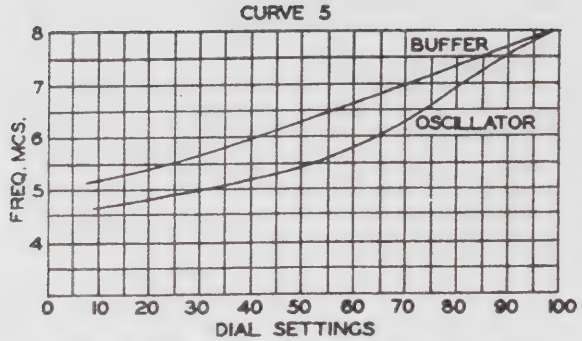
EXCITER CALIBRATION 15 METER POSITION

CURVE 4



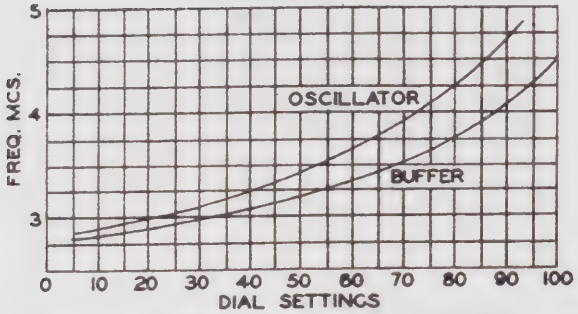
EXCITER CALIBRATION 20 METER POSITION

CURVE 5



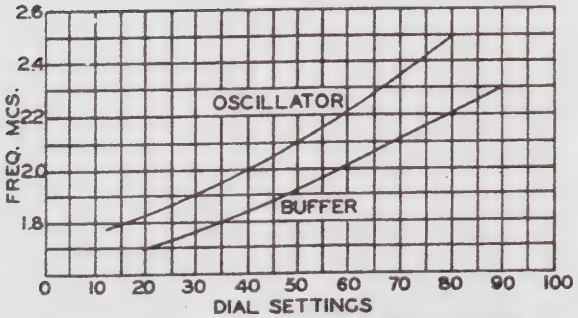
EXCITER CALIBRATION 40 METER POSITION

CURVE 6



EXCITER CALIBRATION 80 METER POSITION

CURVE 7



EXCITER CALIBRATION 160 METER POSITION

TABULATED DATA

Typical conditions, amplifier fully loaded into 50 ohms resistance

Curve #1

Freq.	Final Tuning Setting	Coarse Coupling	Fine Coupling	Remarks
30 MC	98.5	7	55	160 Meter Out
28	95	7	55	"
21	88	7	48	"
14	77	6	45	"
7	51.5	4	98	"
3.839	20	2	74	"
3.610	15	2	70	"
3.610	79	7	100	160 Meter In*
1.994	23	4	38	"
1.805.	11	3	50	"

*Not fully loaded

Curve #2

MO or XTAL Freq. MC.	Oscillator Setting	Buffer Setting	Buffer Output Freq. MC.	P.A. Grid M.A.	Minimum M.O. Voltage Required For P.A. Grid M.A.
15 MO	92	86	30	15 Plate Off	0.8 V
14	85	75	28	15 Plate Off	0.95
				10 Plate On	0.95
				15 Plate On	1.95
12.8	77	62	25.6	15 Plate Off	6.4
10.8	51	20	21.2	15 Plate Off	1.4
9.34	23				
9.07	17				
7.00 XTAL	85	75	28	16.5 Plate Off	
				13.5 Plate On	
7.00 MO	85	75	28	15 Plate Off	5.6

Curve #3

7.6 MC	88	100/	22.8		
7.0	79	85	21.0	15/	XTAL
7.0	79	85	21.0	15	2.2 V
6.0	58	58	18.0	15	7.0
5.0	25	25	15.0	15/	XTAL

Curve #4

7.3	83	93	14.6	15	1.4 V
7.0	80	86	14.0	15	1.1 V
7.0	80	86	14.0	15/	XTAL
6.0	60	61	12.0	15	1.4 V
5.0	26	18	10.0	15/	XTAL
4.95	23	98	14.85		XTAL
4.80	16	4	9.60	15	XTAL

Curve #5

8.0	100	98	8	15	1.0 V
7.6	90	85	7.6	15	.92 V
6.0	67	42	6.0	15	.45 V
5.0	34	0	5.0	15/	XTAL

NOTE: The use of 80 meter crystals and doubling in the oscillator stage is satisfactory for 40 meter operation.

Curve #6

4.53	85	100	4.53	15/	XTAL
4.00	72	87	4.00	15/	XTAL
3.5	52	66	3.50	15	.2 V
3.0	22	34	3.00	15	.25 V
2.8	5	11	2.80	15	.7 V

Curve #7

2.4	73	97	2.4	15	.3 V
2.3	65	87	2.3	15	.3 V
2.0	38	57	2.0	15	.35 V
1.9	30	50	1.9	15	.35 V
1.8	15	34	1.8	15	.45 V

Viking I Transmitter

Bill of Material

Part No. or Drawing No.	Item No.	Qty.	Description
197-111-5	CH 1	1	Cabinet
17.750	CH 2	1	Chassis
17.751-3	CH 3	1	Panel
23.900-1	BKT 1	1	Final Tuning Drive Assembly
17.754-1	BKT 2	1	Bracket - Final Cond. Mounting
17.752-1	BKT 3	1	Bracket - Final Tank Support
16.357-2	BKT 4-7	4	Bracket - Crystal Sel. and Mounting
16.1001-1	BKT 8-12	5	Bracket - Component Mounting
16.29-1	BKT 13	1	Bracket - Plate Coup. Cond. Mounting
23.906-1	D 1	1	0-100 Final Tuning Dial and Hub
23.908-1	D 2	1	Final Tuning Index and Escutcheon Plate Assembly
23.909	D 3-6	4	Drive Pulley Hub Assembly
42.49-150	D7-8	8-1/2 ft.	Dial Cord for Coupling Condenser and 160 M Switch
16.1027-1	D 9-10	2	Dial Cord Tension Springs 9/16 x 3/16 x .033 Wire
14.145-7	D 11	1	1/4" D. NPB Shaft Extension 5-1/2" long
14.145-6	D 13	1	1/4" D. NPB Shaft Extension 2-1/4" long
115-256-15	D 14	1	Shaft and Bearing Assembly 1-5/8" length
115-256-16	D 15	1	Shaft and Bearing Assembly 5-1/16" length
104-250-51	D 16	1	Insulated Coupling
13.123-7	D 17	2	Panel Bearing
104-258	D 18-19	2	Split Sleeve Coupling
23.910-2	K 1	1	Knob - Final Tuning
23.907-12	K 2-4	3	Knob Dial (100-0)
23.907-13	K 5-7	3	Knob Dial (10-0)
23.907-14	K 8-9	2	Knob Dial (Single Marker)
23.907-17	K 10	1	Knob Dial (Meter)
23.907-15	K 11	1	Knob Dial (7-1)
23.907-16	K 12	1	Knob Dial (Bandswitch)
		1	#4 Hardware Envelop
		1	#6 Hardware Envelope
		1	#8 Hardware Envelope
		1	#10 Hardware Envelope
		1	3/8" Hardware Envelope
		1	Terminal and Lug Hardware Envelope
23.08-1	Hw. 438	1	Envelope for C30 154-2 Condenser Hdw.
133-278-7	S1 S2 S5	3	1-3/4" Miniature Tube Shield
133-278-8	S6	1	2-1/4" Miniature Tube Shield
17.755	S4B	1	Oscillator Buffer Shield
17.756	S4A	1	Oscillator Buffer Shield
120-277B	X1 X2 X5 X6 X11	5	Shielded 7 Pin Miniature Socket
122-225	X3 X4	2	5 Pin Wafer Socket
122-101-8	X7	1	7 Pin Large Shielded Wafer Socket
122-228	X8 X9 X10 X12	4	Octal Wafer Socket
147-620	X13A	1	115 V Candelabra Socket

147-600	X14A	1	6 V Miniature Socket
147-310-2	X13B	1	Faceted Jewel - red
147-310-3	X14B	1	Faceted Jewel - green
126-120	X15	1	Crystal Mounting Board
22.739	X16	1	Fuse Extractor Post (for 3 AG Fuse)
22.740-5	X17-19	3	"2005" Jones Terminal Strip
22.740-6	X20-22	3	"2006" Jones Terminal Strip
71.32-170	G1	1 Ft.	RG8U Cable (cut to length)
71.32-178	G2	1¼ Ft.	RG59U Cable (Cut to length)
22.741	G3	1	Line Cord and Plug
22.113-1	G4-7	5	Rubber Grommet 9/16 OD X 5/16 ID
22.742	F1	1	5A 3AG Type Fuse
42.24-75	G13	8"	.034 ID spaghetti
26.182	W1	1	Wiring Harness
71.91-100	W2	10 Ft.	Black Plastic Covered "20 Hookup Wire
71.27-125	W3	7 Ft.	#24 Tinned Copper Wire
71.27-110	W4	4 Ft.	#14 Tinned Copper Wire
71.49-105	W5	1/2 Ft.	#20 Stranded Bare Shielded Wire
42.49-140	W6	6 Ft.	#4 Waxed Lacing Cord
119-854	TC1	1	.566 Tube Cap
119-852	TC 2-3	2	.360 Tube Cap
22.744	J1	1	Amphenol PCIM Mic. Connector
22.745	J2	1	Mallory A2 Ckt. Closing Jack
22.746	J3-4	2	Amphenol 83-1R Receptacles
22.747	H1-2	2	Amphenol 83-1H Hood
23.914-1	SH1-SH2	2	100 M.V. Shunt for 500 ma.
22.771	SH3 SH4	2	100 M.V. Shunt for 25 ma.
22.113-5	G8-12	5	Rubber Grommet 11/32 OD x 1/8 ID
22.712	SH5	1	100 M.V. Shunt for 50 ma.
SNC# P1783	L1	1	10 h 320 ma Filter Choke
SNC# P1501	L2	1	15 h 95 ma Filter Choke
SNC# P1784	L3	1	10 h 35 ma Filter Choke
23.902-1	L4	1	Oscillator Coil
23.902-2	L5A	1	Buffer Coil
23.902-3	L10	1	160 Meter Aux. Coil
102-750	L6	1	750 R. F. Choke
102-754	L7	1	754 R. F. Choke
23.911	L8	1	Residual H. F. Final Coil
229-201	L9	1	Final Tuning Inductor
23.912	L11	1	Parasitic Suppressor
23.913	L5B	1	H. F. Buffer Coil
SNC# P1781	T1	1	H. V. Plate Transformer
SNC# P1782 or P1893	T2	1	L. V. and Fil. Transformer
SNC# P1503	T3	1	Audio Driver Transformer
SNC# P1785 or P1992	T4	1	Modulation Transformer
22.755	SW1	1	SPST (6A-125V) Bat Handle Toggle Switch
22.756	SW2	1	DPST (6A-125V) Bat Handle Toggle Switch
22.757	SW3	1	3 Pole 2 Pos. (CW-PH) Switch
22.758	SW4	1	2 Pole 6 Pos. (Band) Switch
22.759	SW5	1	1 Pole 7 Pos. (Coupling) Switch
22.769	C8	1	.5 mfd 600 V. [illegible] Paper Condenser

22.760	SW6	1	2 Pole 2 Pos. (160M) Switch
22.761	SW7	1	2 Pole 6 Pos. (Meter) Switch
22.628	SW8	1	1 Pole 11 Pos. (Crystal) Switch
167-104-2	C18	1	75L15 Variable Condenser
167-104-3	C22	1	75 mmf. variable condenser with long shaft
154-2-3	C29	1	350E20 Variable Condenser
154-2-1	C30	1	350E20 Variable Condenser
22.763	C1	1	10 mfd 25 V. W. Electrolytic Cond.
22.764	C10 C11	1	Dual 15-15 mfd 450 V. W. Electrolytic Cond.
22.765	C12 C13	1	Dual 15-15 mfd 150 V. W. Electrolytic Cond.
22.766	C2	1	.003 mfd 400 V. W. Paper Condenser
22.767	C3 C6	2	02 mfd 400 V. W. Paper Condenser
22.768	C4	1	.1 mfd 400 V. W. Paper Condenser
22.770	C5	1	.01 mfd 1000 V. W. Molded Tubular Cond.
22.771	C9	1	8 mfd 1000 V. W. Oil Filled Condenser
22.773	C14	1	50 mmfd 450 V. W. Molded Mica Condenser
22.774	C33 C34 C35	3	300 mmfd 450 V Molded Mica Condenser
22.772	C36 C37 616 C24 C26 C27	2	300 mmfd 600V Mica Condenser
22.775	C15 C17 C19 C21 C23 C39 C40	11	.005 or .0047 mfd 450 V. W. Mica Condenser
22.776	C20	1	50 mmfd 450 V. W. Silver Mica Condenser
22.777	C25	2	25 mmfd 450 V. W. Silver Mica Condenser
22.778	C38	1	150 mmfd 1200 V. W. Mica Condenser
22.779	C28 C31	2	.002 or .0022 mfd 1200 V. W. Mica Condenser
22.545	C32	1	.01 mfd 1200 V. W. Mica Condenser
22.719	R1	1	1 megohm - 1/2 Watt Resistor
22.715	R2	1	2000 ohm - 1/2 Watt Resistor
22.718	R3 R18	2	.47 Megohm - 1/2 Watt Resistor
22.716	R5	1	24,000 or 22,000 ohm - 1/2 Watt Resistor
22.714	R7	1	220 ohm - 1/2 Watt Resistor
22.717	R23	1	51,000 ohm - 1/2 Watt Resistor
22.728	R4 R9	2	.24 or .22 Megohm - 1 Watt Resistor
22.726	R8	1	51,000 or 47,000 ohm - 1 Watt Resistor
22.722	R15	1	1500 ohm - 1 Watt Resistor
22.721	R16	1	820 ohm - 1 Watt Resistor
22.724	R17 R24	2	2700 ohm - 1 Watt Resistor
22.727	R19	1	62,000 or 68,000 ohm - 1 Watt Resistor
22.720	R20 R26	2	100 ohm - 1 Watt Resistor
22.723	R27	1	2000 ohm - 1 Watt Resistor
22.725	R21	1	4700 ohm - 1 Watt Resistor
22.713	R22	1	22 ohm - 1/2 Watt Resistor
22.731	R6	1	.5 Megohm Linear Volume Control
22.732	R25	1	25,000 ohm W. W. Potentiometer
22.729	R13	1	20,000 ohm W. W. Adjustable Resistor
22.730	R28	1	10,000 ohm W. W. Fixed Resistor
22.762	M1	1	5 ma Meter 20 ohm
22.21	I1	1	#6S6 120 Volt Candelabra bulb
22.743	I2	1	#40 6-8 Volt min. screw bulb

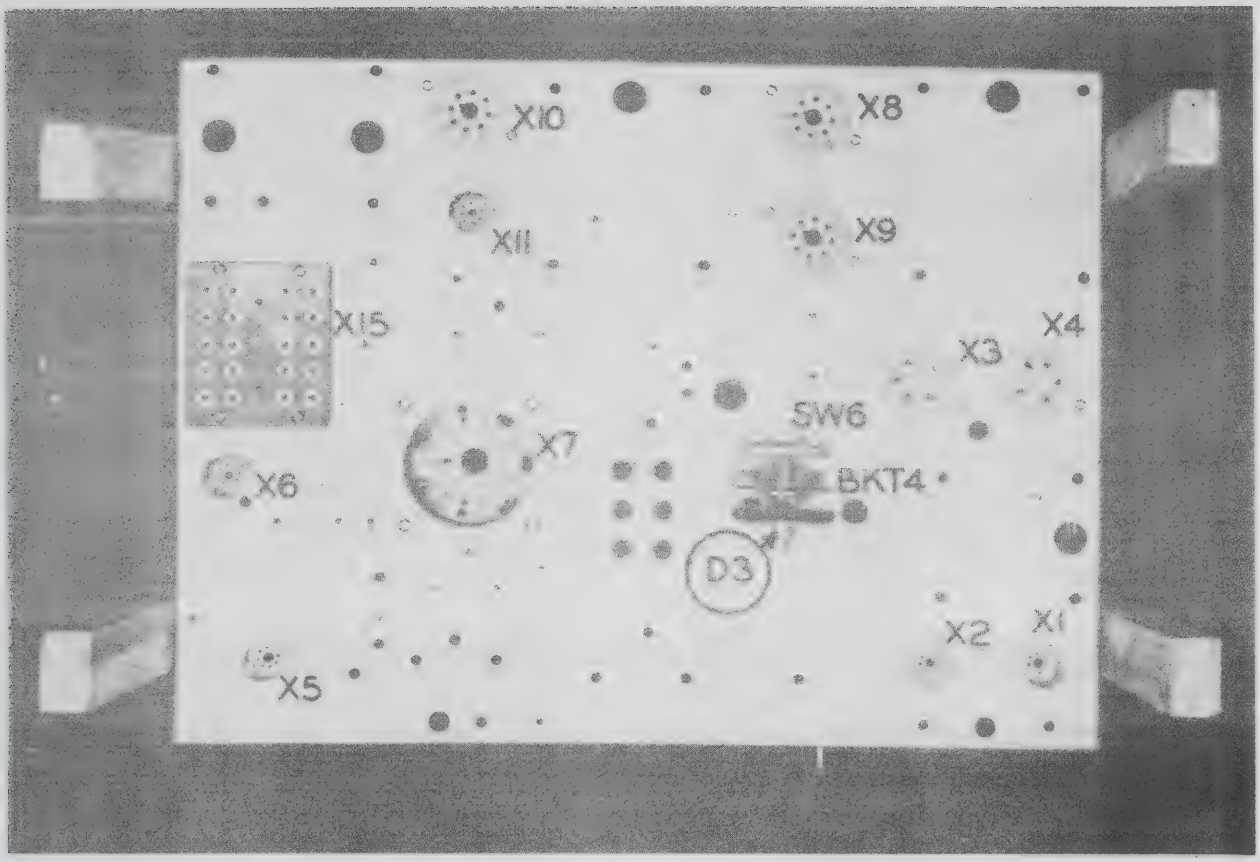


Figure 1

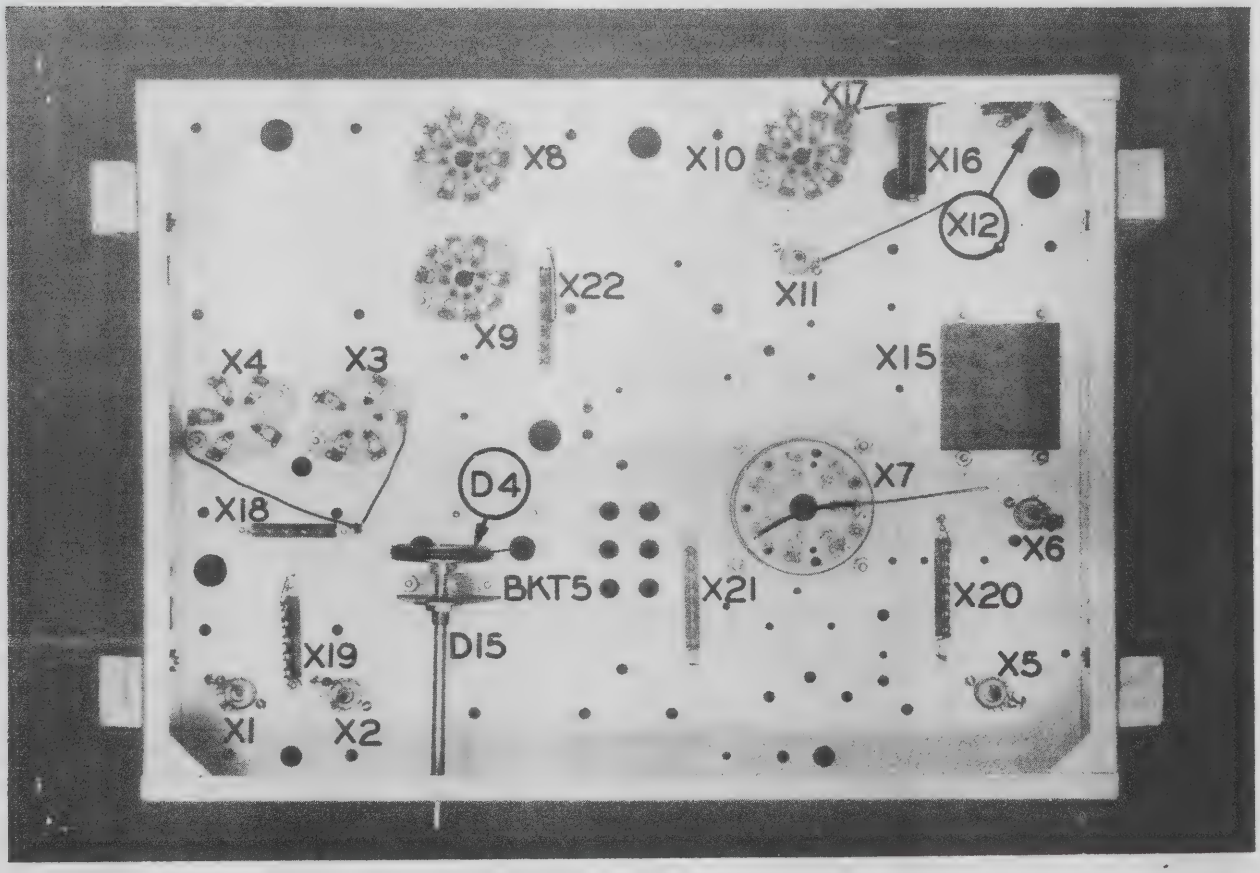


Figure 2

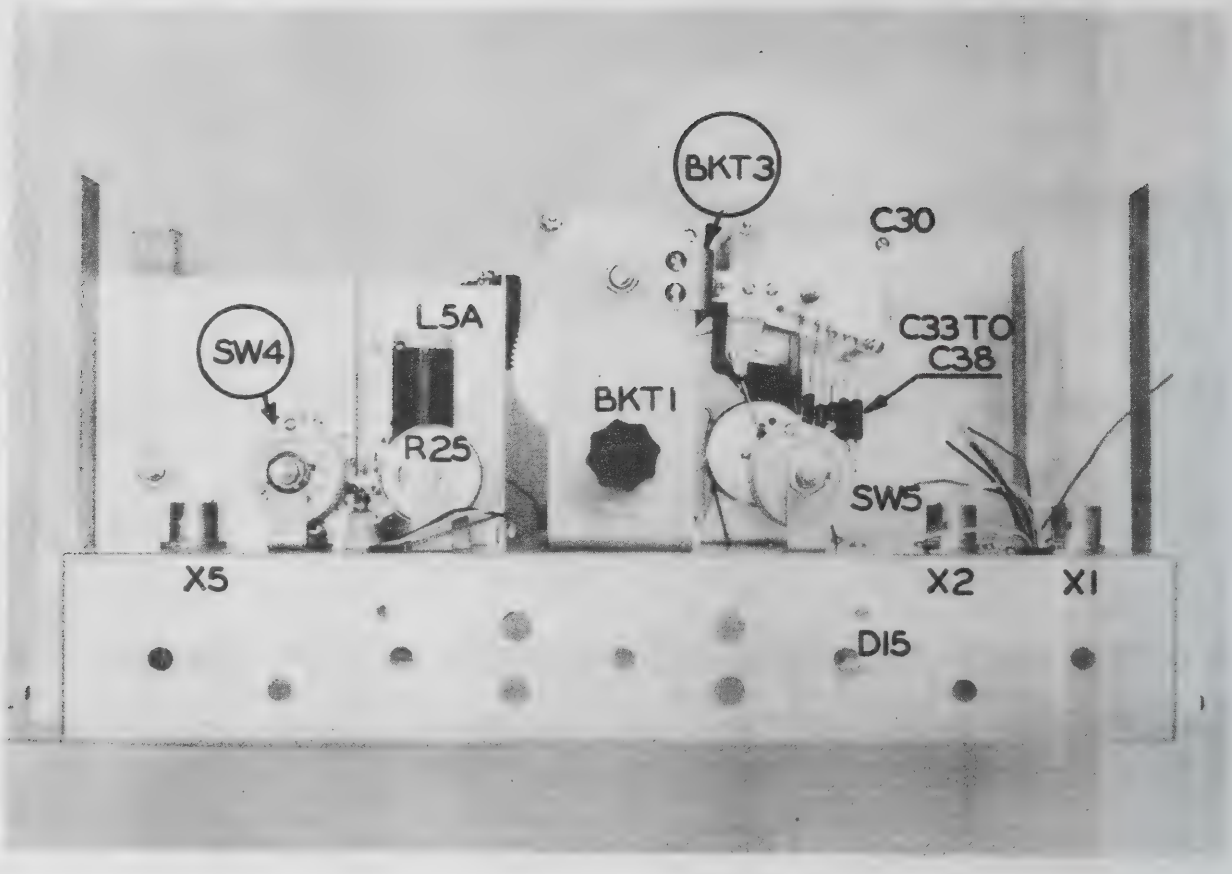


Figure 3

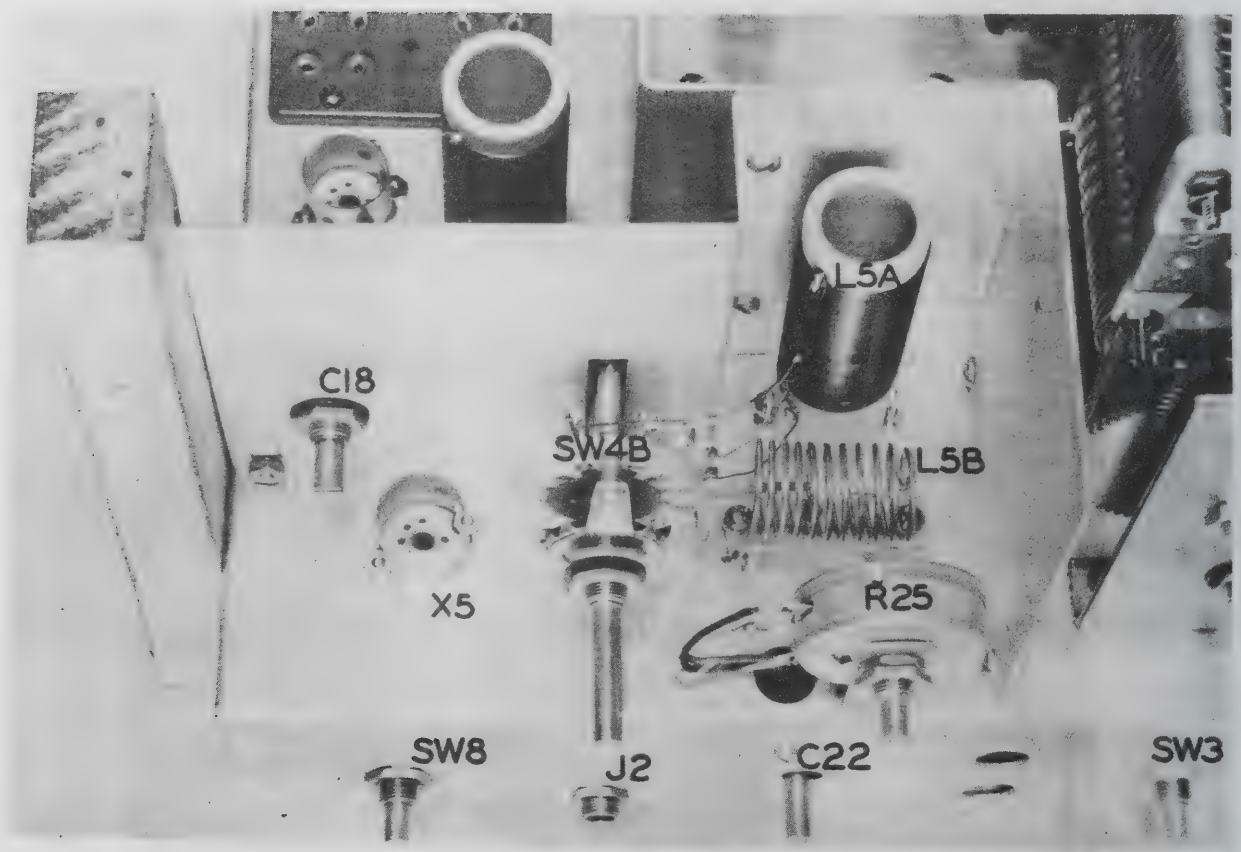


Figure 4

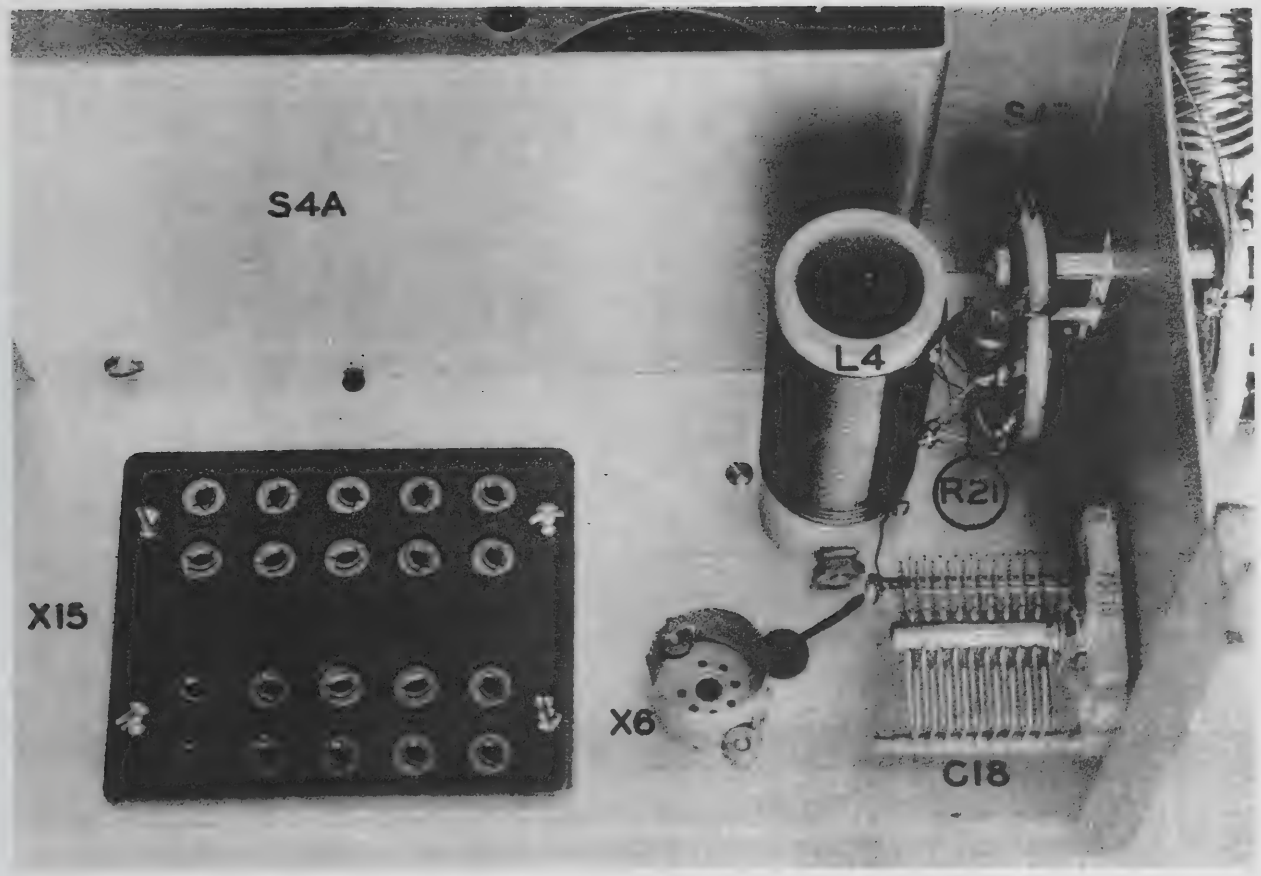


Figure 5

Figure 6

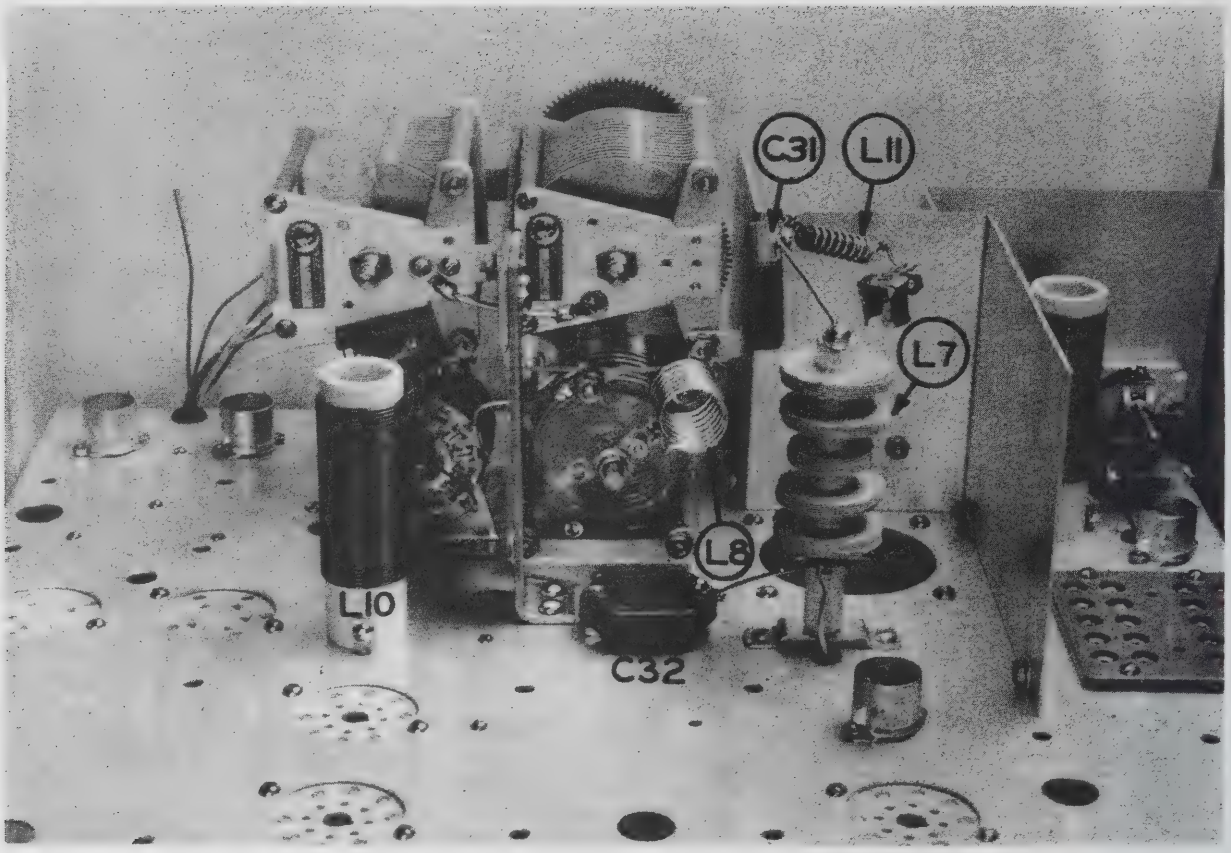


Figure 7

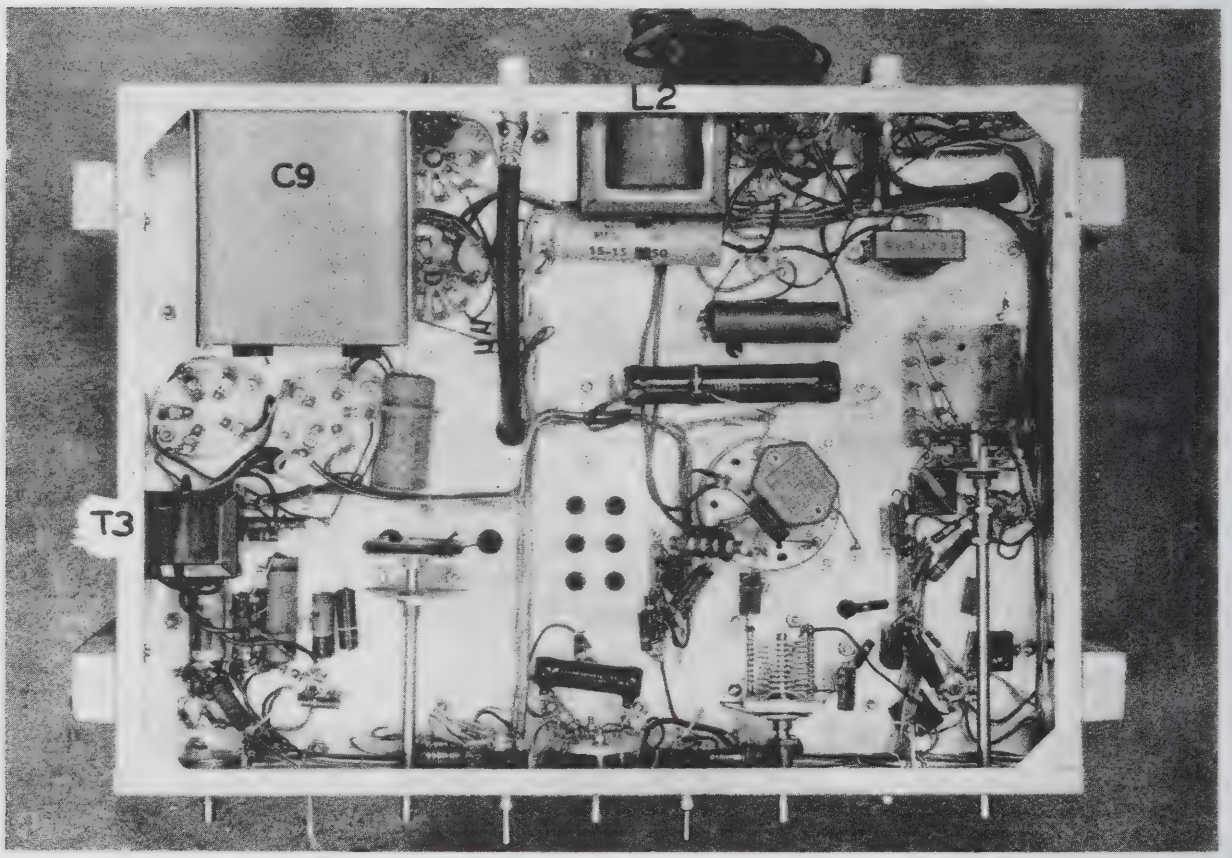


Figure 8

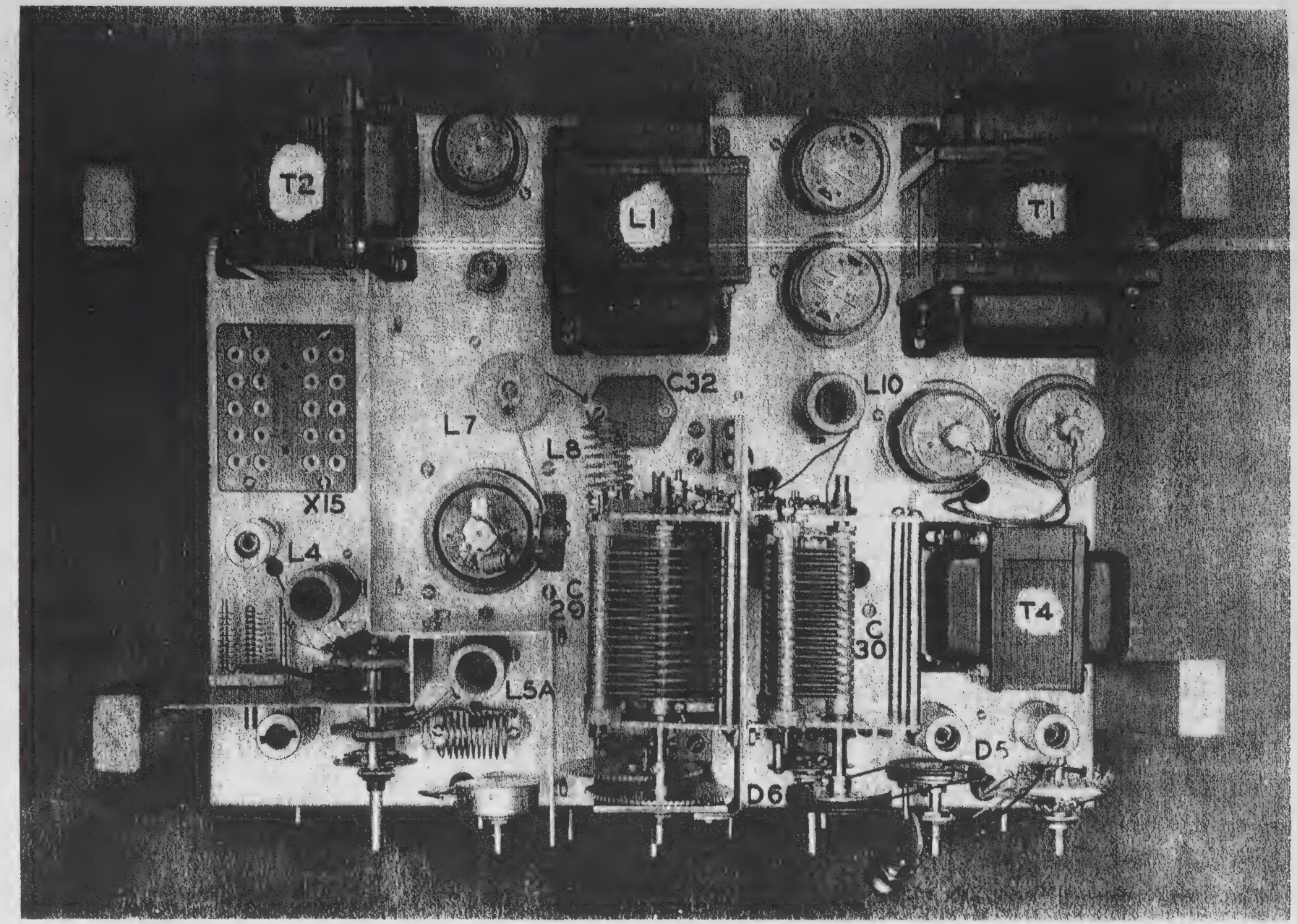


Figure 9

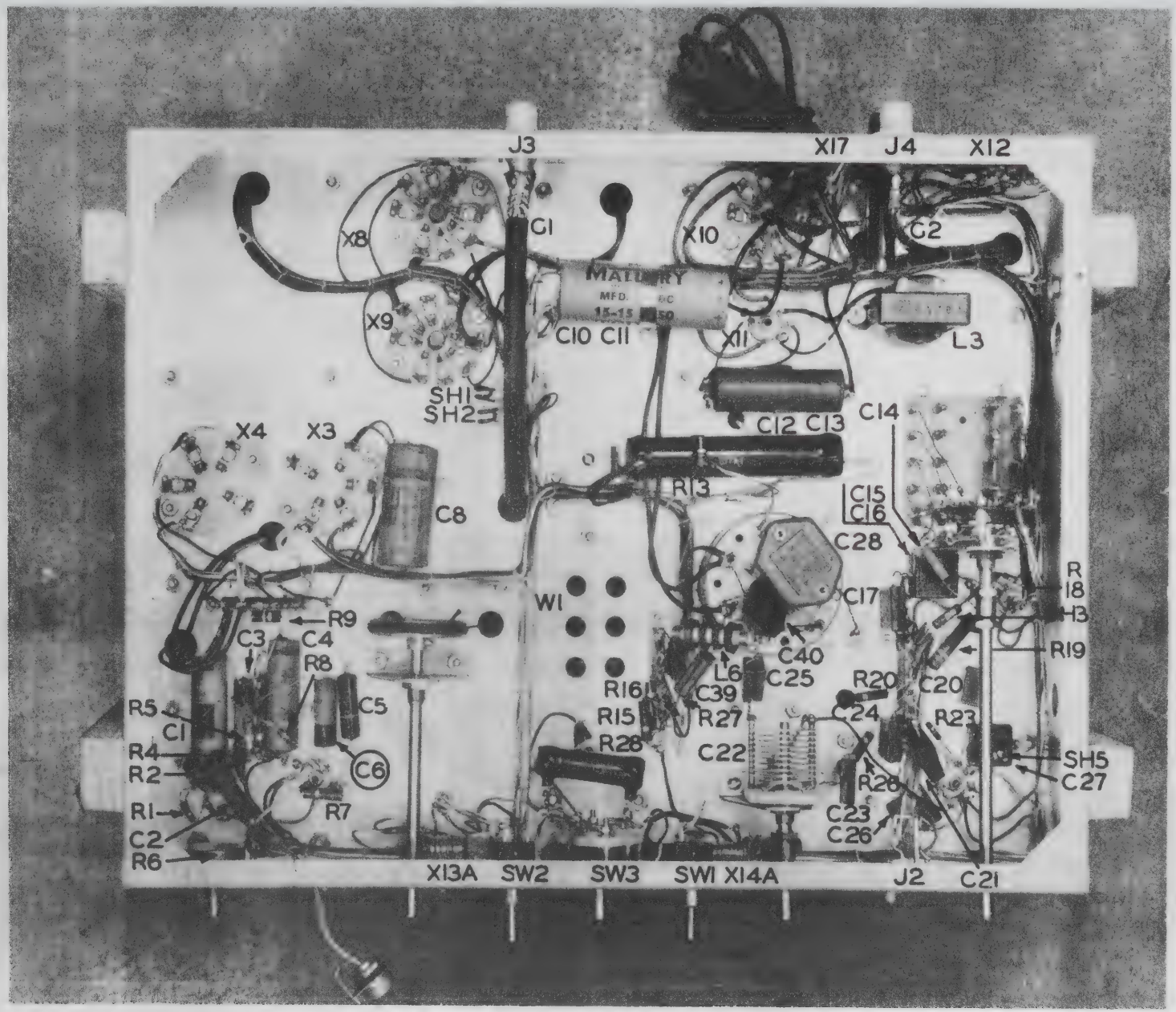

J3
X17
J4
X12
C1
X8
X10
C2
MALLORY
MFD.
X9
C10 C11
X11
L3
SH1
SH2
C12 C13
C14
X4
X3
R13
C15
C16
C8
C28
R
18
C17
W1
H3
R9
C3
C4
C40
R19
R8
L6
C25
R20
C20
R16
C39
C24
R23
R5
C5
R15
R27
C1
R28
C22
SH5
R4
C27
C6
R2
R26
R1
R7
C23
C26
C2
R6
X13A
SW2
SW3
SW1
X14A
J2
C21

Figure 10

MODIFICATION B FOR VIKING II TRANSMITTER

(Equally applicable to all VIKING I Transmitters)

Incorporation of Modification B in the VIKING transmitter will extend the usable low frequency audio range to 250 cycles and will further attenuate high frequency response above 3000 cycles.

The change is accomplished by converting V2, the 6AU6 audio driver to a triode, removing the feedback circuit and changing plate and screen resistors of V1, the first audio stage, to higher values. Total audio gain is slightly higher.

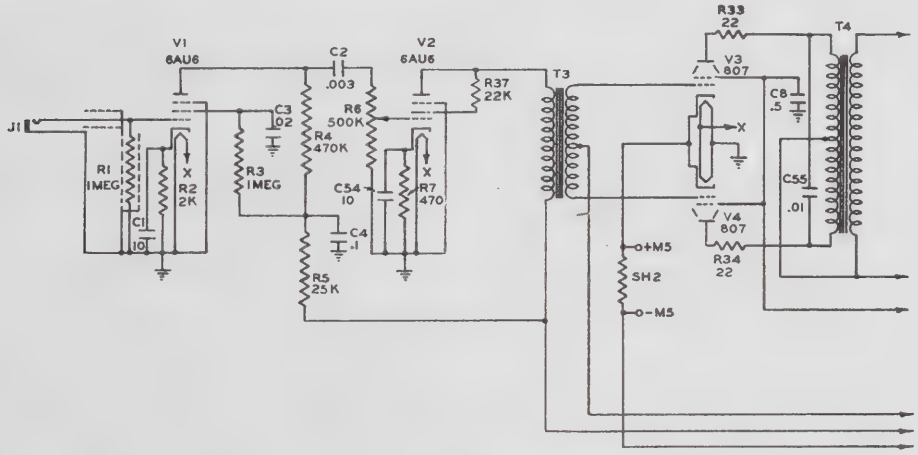
The 23.1033 modification kit consists of the following material:

1—470,000 ohm ½ watt resistor.
1—1.0 megohm ½ watt resistor.
1—470 ohm ½ watt resistor.
1—10 mfd. 25 volt electrolytic capacitor.
1—.01 mfd. 1500 WV ceramic disc capacitor.
2—22 ohm ½ watt resistors.
1—length of spaghetti tubing.
1—22,000 ohm ½ watt resistor

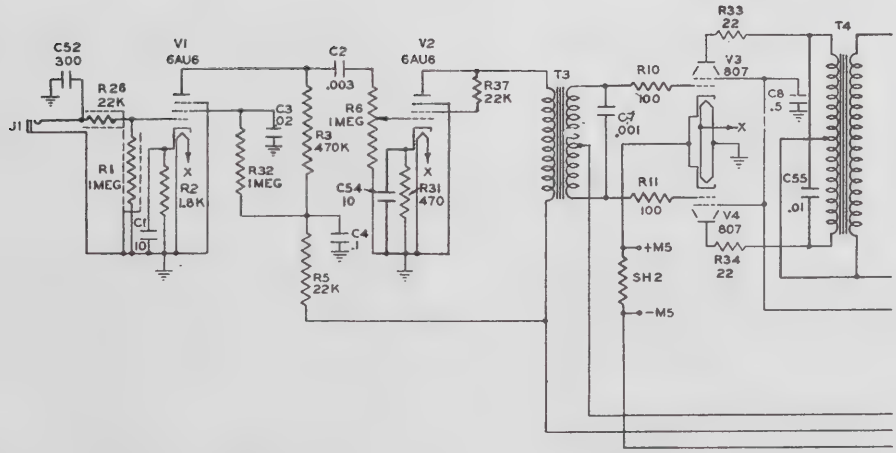
The following items furnished for Viking II Transmitters, are not required for Viking I:

1—56 ohm 1 watt resistor.
1—10,000 ohm 2 watt resistor.
1—.1 mfd. 400 volt tubular capacitor.
1—23.1301 relay plug.

Affected portions of schematic diagrams are shown below.



VIKING I AUDIO



VIKING II AUDIO

Detailed Instructions for Incorporation

1. Loosen the audio driver transformer T3 by removing its mounting screws.

2. Remove the black lead of T3 and wiring harness lead 22B (black) from terminal board X18. Slip a 1" length of insulated tubing over lead 22B. Solder lead 22B to the black lead of T3. After cooling, slide the tubing over the solder joint.

3. Remove R9, 220,000 ohm 1 watt resistor from terminal strip X18.

4. Remove C5, .01 mfd. capacitor connected between pin 7 of socket X2 and the terminal of X18 nearest the center of the chassis.

5. Remove R8, 47,000 ohm 1 watt resistor connected between pin 6 of X2 and the center terminal of terminal board X19.

6. Remove C6, .02 mfd. capacitor connected between pin 6 of X2 and ground.

7. Remove R4, 220,000 ohm 1 watt resistor connected between pin 5 of socket X1 and the terminal of X19 nearest the front of the chassis.

8. Remove R3, 470,000 ohm ½ watt resistor connected between pin 6 of socket X1 and the terminal of X19 nearest the front of the chassis.

9. Remove R7, 220 ohm ½ watt resistor connected between pins 4 and 7 of X2.

10. Connect the 1 megohm ½ watt resistor from the modification kit between pin 6 of socket X1 and the terminal of X19 nearest the front of the chassis. Solder at pin 6 only.

11. Solder the 470,000 ohm ½ watt resistor from the modification kit between pin 5 of socket X1 and the terminal of X19 nearest the front of the chassis.

12. Connect the 470 ohm ½ watt resistor from the modification kit between pins 4 and 7 of socket X2. Solder at pin 4 only.

13. Connect the positive terminal of the 10 mfd. 25 volt capacitor from the modification kit to pin 7 of X2, the negative terminal to the ground lug at the rear of terminal board X19. Solder at both points.

14. Between pins 5 and 6 of X2 solder the 22,000 ohm ½ watt resistor from the modification kit.

15. Unsolder the plate cap connectors from the blue and brown leads of the modulation transformer T4. Pull the leads back through the grommet in the chassis.

16. Train the blue lead to the terminal of X18 nearest the center of the chassis, trim to length, strip ⅜" of the insulation and tin the lead with solder. Connect but do not solder to the terminal. Save the excess length of blue lead.

17. Train the brown lead to the terminal of X18 adjacent to the end terminal to which the blue lead was previously connected. Cut the brown lead to length, strip ⅜" of the insulation, tin with solder and connect to the terminal second from the end of X18 nearest the center of the chassis.

18. Connect the excess lengths of blue and brown lead to the corresponding terminals of X18 to which the transformer leads of the same color were connected. Do not solder.

19. Solder the .01 mfd. 1500 volt ceramic disc capacitor from the modification kit between the end terminal of X18 nearest the center of the chassis and the next adjacent terminal. Don't permit the capacitor to touch the chassis.

20. Run the blue and brown leads from X18 through the grommet between the 807 sockets. Slide a 1½" length of insulating tubing over each of the leads.

21. Strip ⅜" of insulation from the brown lead, tin with solder. Trim one of the leads of a 22 ohm ½ watt resistor from the modification kit to about ⅜", form a hook in the lead and solder to the brown lead. In the same fashion solder the other 22 ohm ½ watt resistor to the blue lead.

22. Solder an 807 plate cap to each of the remaining 22 ohm resistor leads. Shorten the resistor leads so that the plate cap connector is close to the body of the resistor. When the solder connections are cool, slide the insulated tubing over the resistors and the ends of the plate cap connectors.

    NOTE: It will no longer be necessary to observe polarity when connecting 807 plates.

23. Secure the audio driver transformer using the original hardware.

THE FOLLOWING INSTRUCTIONS APPLY ONLY TO VIKING II TRANSMITTERS

24. Remove L22, 4.7 microhenry choke connected between pin 3 of socket X17 and the end terminal of X25 nearest the crystal socket X15.

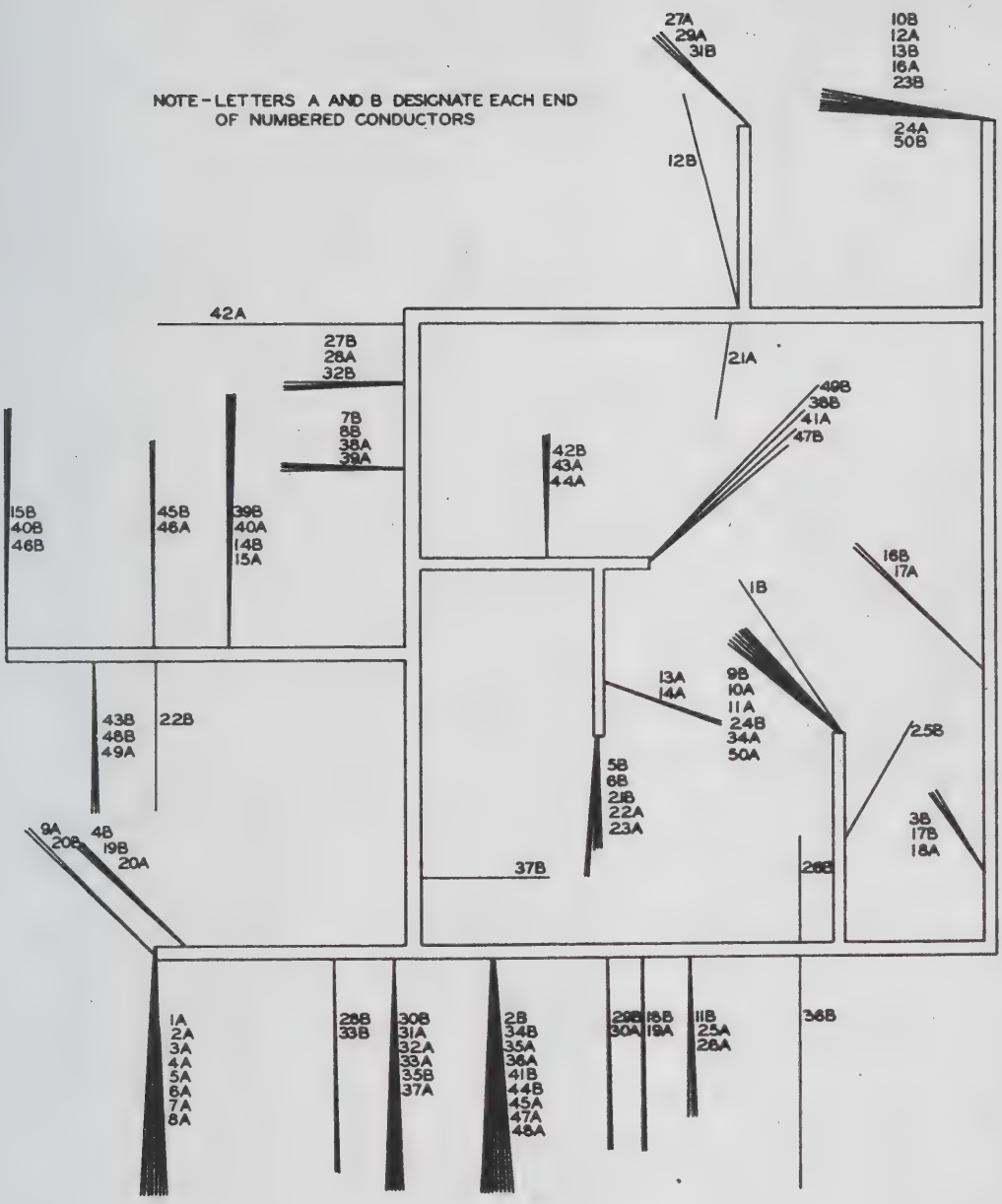
25. In place of L22 just removed, solder the 56 ohm 1 watt resistor from the modification kit.

26. Looking at the front deck of the bandswitch, SW4B, from the shaft end, refer to the upper left hand terminal as No. 1, the adjacent terminal No. 2 and the balance of the terminals in consecutive order in a clockwise direction, the last terminal being No. 7. The 10,000 ohm 2 watt resistor from the modification kit is to be installed between SW4B and the exciter shield. Cut to length and solder the resistor leads, one to terminal No. 4 of SW4B, the other to terminal No. 1 of SW4B.

27. (It is assumed that Modification A has been installed or that the subject Viking II transmitter conforms to the Schematic Diagram, Figure 12, in which the 6AQ5 clamper tube V28 appears.) Connect the .1 mfd. 400 volt capacitor from the modification kit between pin 5 of socket X3 and the terminal of R30 to which R29 has been previously connected. The end of the capacitor marked "ground" or "outside foil" should be connected to X3. Solder at both points.

28. Remove L15, 4.7 microhenry choke connected between pin 7 of the VFO power socket X12 and the terminal of X24 to which the green harness leads are connected. Wind a self-supporting, single layer, close wound choke of No. 20 or No. 22 solid insulated wire, ¼" inside diameter, 15 turns. Solder this choke in place of L15 just removed.

    The connector 23,1031 will serve to connect an antenna changeover relay to the antenna relay socket J5 on the rear of the Viking II chassis.



LEAD COLORS	
1	BLUE
2	BROWN
3	GREY
4	BLACK
5	ORANGE
6	WHITE
7	YELLOW
8	VIOLET
9	RED
10	RED
11	RED
12	RED
13	GREEN
14	GREEN
15	GREEN
16	GREEN
17	GREEN
18	GREEN
19	GREEN
20	GREEN
21	WHITE
22	BLACK
23	BLACK-BROWN
24	BLACK-BROWN
25	WHITE
26	BLACK
27	BLACK-BROWN
28	BLACK-BROWN
29	WHITE
30	BLUE-ORANGE
31	BLUE-ORANGE
32	GREY-RED
33	GREY-RED
34	BROWN
35	ORANGE
36	BLUE
37	BLACK
38	YELLOW
39	VIOLET
40	VIOLET
41	GRAY-RED
42	VIOLET
43	VIOLET
44	VIOLET
45	YELLOW-BLUE
46	YELLOW-BLUE
47	GREY
48	GREEN-WHITE
49	GREEN-WHITE
50	BROWN

Figure 11, Wiring Harness

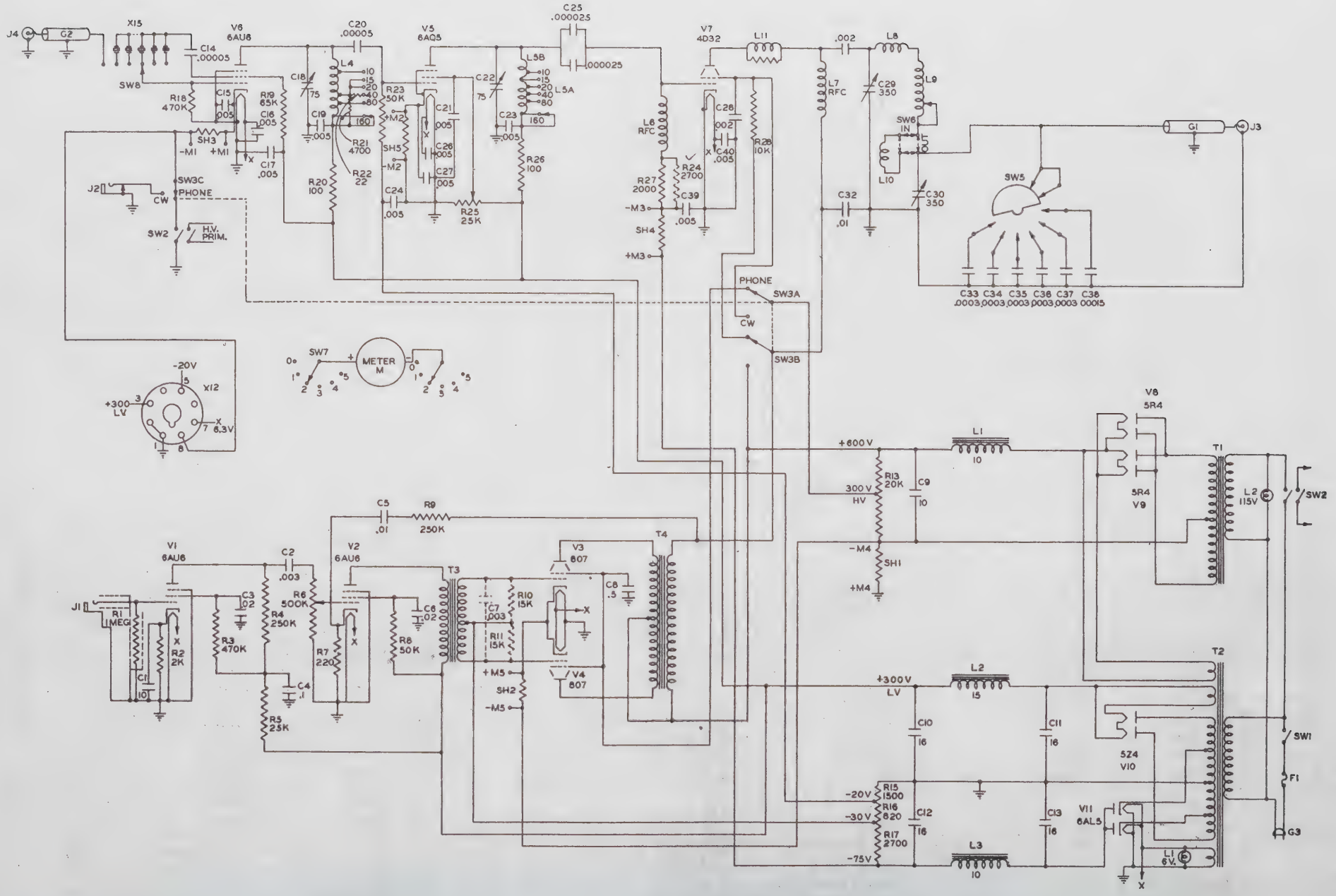


Figure 12, Circuit Diagram

TUBE SOCKET CONNECTIONS BOTTOM VIEW

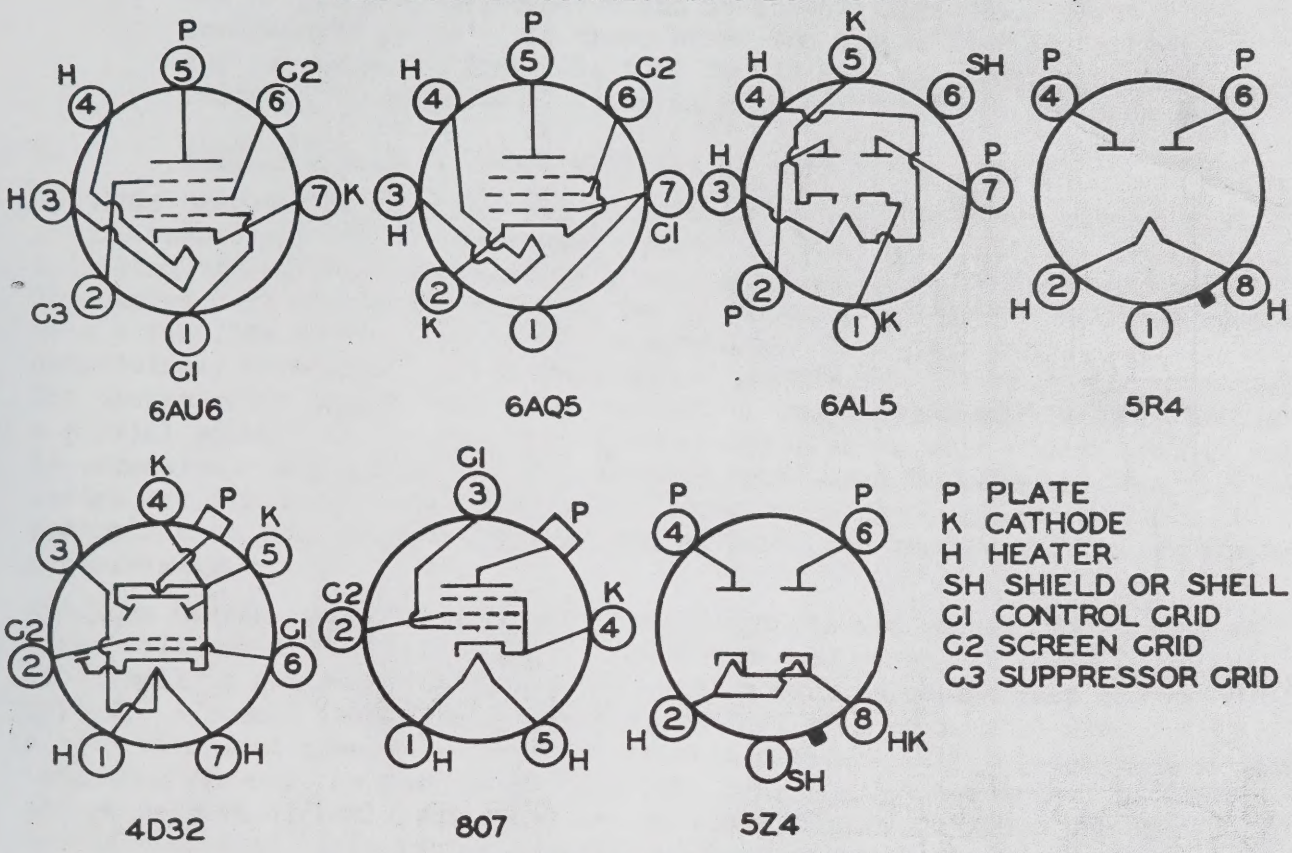
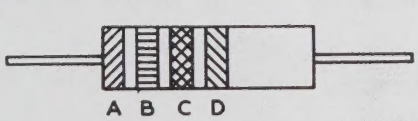


Figure 13, Socket Connections

CONDENSER–RESISTOR COLOR CODE

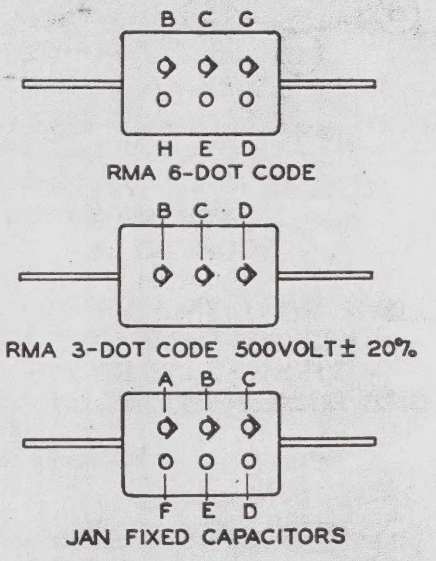
COLOR	SIGNIFICANT FIGURE	DECIMAL MULTIPLIER	TOLERANCE (%)		VOLTAGE RATING*
BLACK	0	1	–		—
BROWN	1	10	1		100
RED	2	100	2		200
ORANGE	3	1,000	3		300
YELLOW	4	10,000	4		400
GREEN	5	100,000	5	*	500
BLUE	6	1,000,000	6		600
VIOLET	7	10,000,000	7		700
GRAY	8	100,000,000	8		800
WHITE	9	1,000,000,000	9		900
GOLD	–	0.1	5		1,000
SILVER	–	0.01	10		2,000
NO COLOR	–	—	20		500

* APPLIES TO CONDENSERS ONLY



COLOR CODING OF FIXED RESISTORS

A–FIRST SIGNIFICANT FIGURE OF RESISTANCE IN OHMS
B–SECOND SIGNIFICANT FIGURE
C–DECIMAL MULTIPLIER
D–RESISTANCE TOLERANCE IN PERCENT. IF NO COLOR SHOWN TOLERANCE IS ± 20%.



COLOR CODING OF FIXED CONDENSERS

A–TYPE: MICA BLACK, PAPER SILVER
B–FIRST SIGNIFICANT FIGURE OF CAPACITY
C–SECOND SIGNIFICANT FIGURE
D–DECIMAL MULTIPLIER
E–TOLERANCE
F–CHARACTERISTIC
G–THIRD SIGNIFICANT FIGURE
H–VOLTAGE RATING

Figure 14, Resistor-Condenser Color Codes

the RF present is excessive and is another indication of an ineffective ground. In cases where the transmitter is feeding a low impedance antenna, the test by touching the chassis is more reliable since 50 to 60 volts is required to ignite the neon lamp.

C. Loading Random Antennas with the Pi Network:

With the transmitter chassis well grounded, correctly designed antenna systems having relatively "flat" unbalanced feeder systems, can easily be loaded by following the instructions already given, provided the antennas' terminal impedances fall within the range of the pi network. Feeding a balanced system with a feedline over a quarter of one wavelength long, may prove to be surprisingly successful if the transmitter chassis is held at ground potential. The transmission line between the transmitter and antenna will tend to assume a partial balance at the antenna. Some standing waves will result but may not be excessive. Methods of changing from an unbalanced to balanced transmission system are discussed in the ARRL Radio Amateurs Handbook and devices for accomplishing this change over the amateur bands are beginning to be available commercially.

Antennas having random lengths, random feed points and various types of feed lines will exhibit widely different resistance and reactance characteristics. It is well to remember that the feedline is a very important part of the system. A common example of the random antenna is a horizontal wire fed by a single wire feed line. The feedline in this case actually becomes part of the radiating system. An antenna of this type can, in most instances, be fed by the pi network directly but there are critical dimensions where the antenna series reactance (inducive or capacitive) becomes too high and the antenna resistance can become either too high or too low to be matched by the pi network.

Antennas with high terminal resistance or reactance can usually be recognized while loading the final stage of the Viking I. The final amplifier is normally loaded by reducing the output coupling capacitor (C30) in small steps, retuning the amplifier to resonance each time. This results in an increase in PA cathode current and is continued until full loading is achieved. If however, a point is reached where decreasing the output coupling capacitor (C30) does not result in a marked increase in PA cathode current and the PA is not fully loaded, the antenna can be assumed to have high resistance or reactance at this frequency.

Antennas with low terminal impedance (resistance and reactance both low) can usually be recognized by a noticeable lack of coupling condenser effect in the range of settings normally used at the operating frequency. There will be little or no detuning evidenced as the coupling control is changed.

Several things can be tried in an effort to bring the antenna system into the tuning range of the pi network:

1. Change the length of the feeder line between the antenna and transmitter experimentally 1/8 to 1/4 wavelength.

2. Change the point of connection of the feedline to the antenna 1/8 to 1/4 wavelength.

Viking I Transmitter

Bill of Material

Part No. or Drawing No.	Item No.	Qty.	Description
197-111-5	CH 1	1	Cabinet
17.750	CH 2	1	Chassis
17.751-3	CH 3	1	Panel
23.900-1	BKT 1	1	Final Tuning Drive Assembly
17.754-1	BKT 2	1	Bracket - Final Cond. Mounting
17.752-1	BKT 3	1	Bracket - Final Tank Support
16.357-2	BKT 4-7	4	Bracket - Crystal Sel. and Mounting
16.1001-1	BKT 8-12	5	Bracket - Component Mounting
16.29-1	BKT 13	1	Bracket - Plate Coup. Cond. Mounting
23.906-1	D 1	1	0-100 Final Tuning Dial and Hub
23.908-1	D 2	1	Final Tuning Index and Escutcheon Plate Assembly
23.909	D 3-6	4	Drive Pulley Hub Assembly
42.49-150	D7-8	8-1/2 ft.	Dial Cord for Coupling Condenser and 160 M Switch
16.1027-1	D 9-10	2	Dial Cord Tension Springs 9/16 x 3/16 x .033 Wire
14.145-7	D 11	1	1/4" D. NPB Shaft Extension 5-1/2" long
14.145-6	D 13	1	1/4" D. NPB Shaft Extension 2-1/4" long
115-256-15	D 14	1	Shaft and Bearing Assembly 1-5/8" length
115-256-16	D 15	1	Shaft and Bearing Assembly 5-1/16" length
104-250-51	D 16	1	Insulated Coupling
13.123-7	D 17	2	Panel Bearing
104-258	D 18-19	2	Split Sleeve Coupling
23.910-2	K 1	1	Knob - Final Tuning
23.907-12	K 2-4	3	Knob Dial (100-0)
23.907-13	K 5-7	3	Knob Dial (10-0)
23.907-14	K 8-9	2	Knob Dial (Single Marker)
23.907-17	K 10	1	Knob Dial (Meter)
23.907-15	K 11	1	Knob Dial (7-1)
23.907-16	K 12	1	Knob Dial (Bandswitch)
		1	#4 Hardware Envelop
		1	#6 Hardware Envelope
		1	#8 Hardware Envelope
		1	#10 Hardware Envelope
		1	3/8" Hardware Envelope
		1	Terminal and Lug Hardware Envelope
23.08-1	Hw. 438	1	Envelope for C30 154-2 Condenser Hdw.
133-278-7	S1 S2 S5	3	1-3/4" Miniature Tube Shield
133-278-8	S6	1	2-1/4" Miniature Tube Shield
17.755	S4B	1	Oscillator Buffer Shield
17.756	S4A	1	Oscillator Buffer Shield
120-277B	X1 X2 X5 X6 X11	5	Shielded 7 Pin Miniature Socket
122-225	X3 X4	2	5 Pin Wafer Socket
122-101-8	X7	1	7 Pin Large Shielded Wafer Socket
122-228	X8 X9 X10 X12	4	Octal Wafer Socket
147-620	X13A	1	115 V Candelabra Socket